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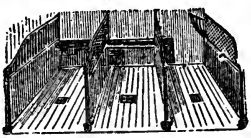

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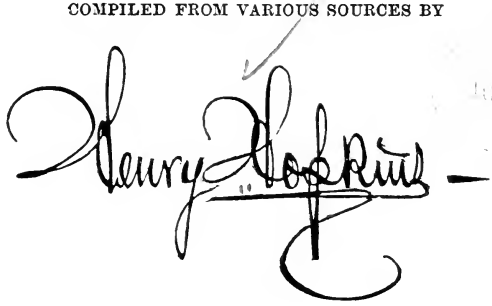

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INDEX TO ADVERTISERS.

PAGE.

AMERICAN MACHINE CO.—Cream Freezers and Ice Chippers..... 46
BARNES, W. F. & JOHN—Foot-Power Machinery..... 86
BISHOP, A. W.—Horse Pokes..... 88
BISSELL CARPET SWEEPER CO.—Carpet Sweepers only..... 40
BRUCE & COOK.—Metals and Tinners' Supplies..... 94
BUSHNELL'S PRICE BOOK.—For Hardware Dealers..... 29
BELL, JOHN W. & CO.—Galvanized Wire Eave-Trough Hanger..... 98
CATSKILL RECORDER.—Printing of all kinds..... 8
CHAMBERS, BERING & QUINLAN CO.—Hog Rings and Ringers..... 74
CHICAGO SEWING MACHINE CO.—Registers and Ventilators..... 2
CHICAGO SPRING BUTT CO.—Spring Butts and Hinges..... 18
CHICAGO SPRING BUTT CO.—Engine House Spring Hinges..... 134
COXHEAD, JOHN F.—Saw Vises and Saw Sets..... 42
CORYELL FLINT PAPER CO.—Flint and Emery Paper..... 2
COOPER, HEWITT & CO.—Iron Wire, &c..... 90
DALES, CHAS. B.—Hardware Specialties and Tools..... 4
DARBY, EDWARD & SONS.—Ornamental Wire Work..... 108
EDWARD STORM SPRING CO.—Dumb Waiters..... 48
EMPIRE PORTABLE FORGE CO.—Forges and Empire Window Pulleys.. 132
EMPIRE WRINGER CO.—Clothes Wringers and Dryers..... 34
EUREKA FIRE HOSE CO.—Woven Fire and Garden Hose..... 26
EDWARD STORM SPRING CO.—Cannon's Nail Sets..... 42
FERDINAND, L. W. & CO.—Yacht, Canoe and Boat Hardware..... 50
GEIGER, J.—Kettle Stand for various uses..... 102
GEIGER & BUSH.—Hand Hammered Copper Kettles, &c..... 102
GILBERT & BENNETT MANFG. CO.—Poultry Netting and Wire Cloth.. 14
GLEASON & ALLEN.—Eagle Washer Cutters..... 44
GRAHAM, J. H. & CO.—Manufacturers' Agents..... 20
GRIFFINGS SONS, H. B. & CO.—Agricultural Implements..... 138
GUYON, C. F. & CO.—Manufacturers' Agents..... 2
HAMMOND, B.—"Slug Shot" and Cottage Colors..... 38
HARDER, MINARD.—Threshing Machines..... 88
HEAD'S IRON FOUNDRY.—Patent Whiffletree Hooks..... 64
HOLBROOK BROTHERS.—Plate and Window Glass..... 130
HOPKINS, HENRY.—Hardware..... 2
HOPKINS, HENRY & CO.—Printing, Engraving and Electrotyping..... 100
HIRAM HOLT CO.—Lightning Hay Knives..... 32
HYNDMAN, W. C. & CO.—Iron Roofing, Siding, &c..... 12
HOW TO KEEP A STORE..... 18
IVES, HOBART B. & CO.—"Burglar Proof" Sash Locks..... 44
JENNINGS, C. E. & CO.—Mechanics' Tools and Hardware Specialties..... 4
JENNINGS & GRIFFIN MANFG. CO.—Britannia Spoons, &c..... 4

INDEX TO ADVERTISERS—Continued.

PAGE.

JOHNSTON, H. M.—Standard Kalsomine..... 38
JONES, JESSE & CO.—Wood Shelf Boxes for Hardware..... 46
JUDD, H. L.—Upholsterers' Hardware and Specialties..... 6
LANE BROS.—Barn Door Hangers and Measuring Faucets..... 142
LEE, JESSE & SONS.—Horse and Toilet Clippers..... 62
LOCKWOOD MANFG. CO.—Locks, Knobs and Builders' Hardware..... 2
MALTBY, HENLEY & CO.—Giant Nail Pullers..... 84
MAXWELL, JOHN & CO.—Bird Cages..... 98
MEDFORD FANCY GOODS CO.—Dog Collars and Furnishings..... 32
MONTAGUE-WOODROUGH SAW CO.—The "B. M. T." Patent Saws.... 22
MORSE, WILLIAMS & CO.—Hoists and Elevators..... 14
METROPOLITAN AGRICULTURAL WORKS.—Agricul. Implements. 138
MILLERS FALLS CO.—Star Hack, Butcher and Bracket Saws.....Cover pp. 4
NASHUA LOCK CO.—Locks, Knobs, &c..... 2
NEW ENGLAND BUTT CO.—Cast Iron Butts..... 2
NEW HAVEN STAPLE WORKS.—Wrought Iron Staples..... 134
NORTHAMPTON CUTLERY CO.—Table Cutlery, &c..... 36
NORTHFIELD KNIFE CO.—Pocket Cutlery..... 76
ONDERDONK, R.—Lemon Squeezers, &c..... 34
ON THE ROAD TO RICHES.—By W. H. Maher..... 86
PALMER MANUFACTURING CO.—Brass and Copper Specialties..... 16
PARAGON NOVELTY CO.—Speed Indicators and General Hardware..... 50
PECK, A. C. & CO.—Axes and Edge Tools..... 2
PENNSYLVANIA WIRE WORKS.—Wire Railing, Grille Work, &c..... 108
POST, CARROLL, JR.—Designer, Draughtsman and Wood Engraver..... 10
RANSOM & CO.—Steam and Gas Fittings..... 48
RICHARDSON BROTHERS.—Saws of all Kinds..... 60
ROGERS FENCE CO.—"Superior" Lawn Mowers..... 140
SCHENCK ADJUSTABLE FIRE BACK CO.—Screw and Shot Cases.... 74
SCHOLLHORN, WM. & CO.—"Star" Shears and Dividers..... 56
STANDARD TOOL CO.—Mechanics' Tools..... 108
SNELL MANUFACTURING CO.—Augers and Auger Bits..... 64
STEVENS, J., ARMS & TOOL CO.—Fire Arms..... 64
SOUTHWARK SCALE CO.—Tea, Counter and Union Scales..... 2
STANLEY RULE & LEVEL CO.—The Celebrated "Odd Jobs."..... 144
STANLEY RULE & LEVEL CO.—Improved Roofing Bracket.....Cover pp. 3
TODD, H. B.—Cutting Nippers and Eave Trough Hangers..... 76
TRAVERS BROTHERS.—Peerless Sash Cord and Twines..... 54
TRENTON IRON CO.—Iron Wire, Bale Ties, &c..... 90
TITUS & BABCOCK.—Cliff's Bolster Springs..... 136
UNIVERSAL ASSISTANT AND COMPLETE MECHANIC..... 98
WHITE, L. & I. J.—Coopers' and Mechanics' Tools..... 62
WESTERN FILE CO.—Files and Horse Rasps..... 66
WESTERVELT, A. B. & W. T.—Ornamental Iron Works.....Cover pp. 2
WILEY & RUSSELL MANFG. CO.—Improved Blacksmiths' Tools..... 68

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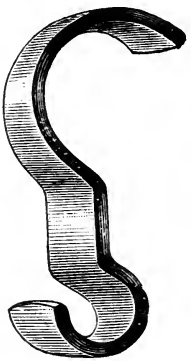

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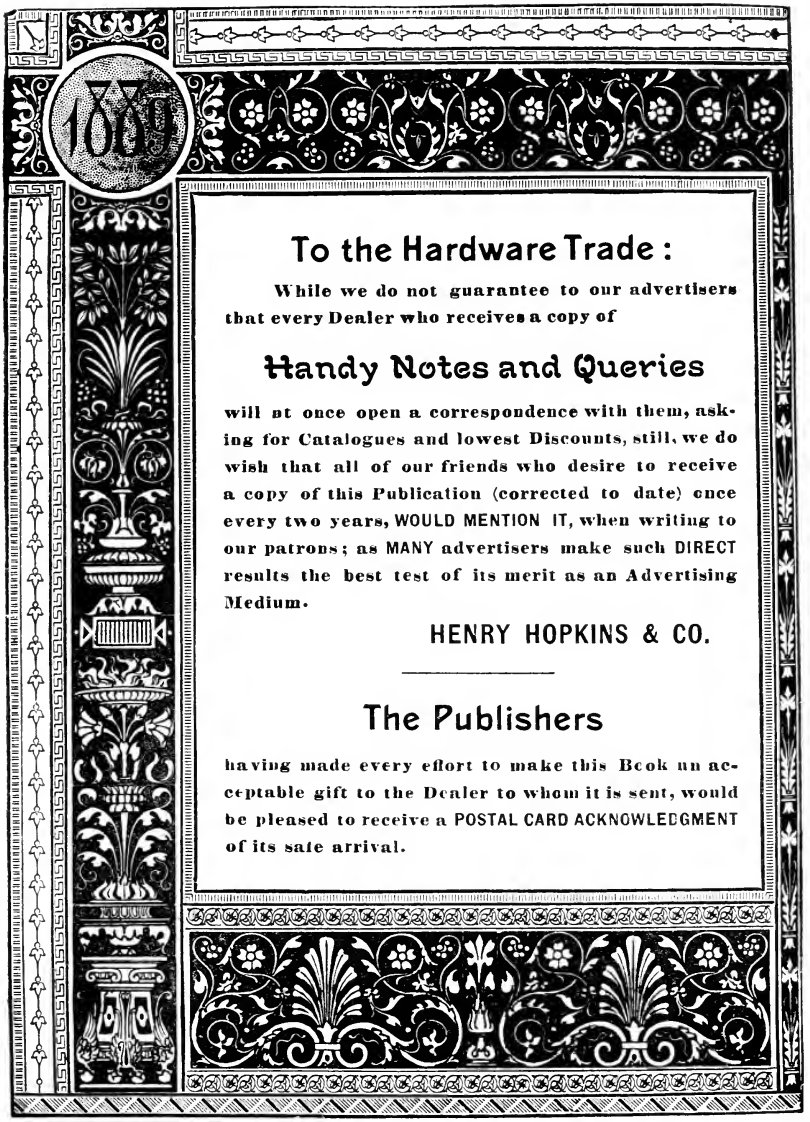
PAGE.

BLOCK TIN PIPE.—Weight to foot 69
BOXES AND SCREWS for Solid Box Vises, dimensions of 58
BOILER RIVETS.—Sizes and number in a keg 119
BREAKING STRAIN of various materials 113
BRASS ESCUTCHEON PINS.—Number to a pound 126
CAPACITY OF CISTERNS, TANKS, etc 143
CAST IRON BALLS.—Weight of 69
COPPER RIVETS AND BURS AND SOLDERING COPPERS 51
CUT NAILS —Extra prices of, above base price 82
CUT NAILS AND TACKS.—Number to a pound 49
DIMENSIONS OF VARIOUS MEASURES OF CAPACITY 141
ELECTRICAL CONDUCTIVITY of various bodies 45
FANNING MILL CLOTH.—Mesh, gauges and sizes 80
GALVANIZED SHEET IRON.—New computations 120
GAUGES OF WIRE BRADS 49
GEOMETRICAL DEFINITIONS 123
HEADS FOR BOLTS.—Standard sizes of 71
HOOP IRON.—Wire gauge and weight to foot 113
IRON AND STEEL TIRE.—Weight of to set 69
IRON COLUMNS.—Sizes and Comparative Strength 111
INTEREST LAWS AND STATUTES OF LIMITATIONS 33
LAG SCREWS.—Weight of 100, any size 123
MACHINE BOLTS AND BOLT ENDS.—Weight of 100, any size 124
NON-CONDUCTIVITY of various coverings 45
OVAL SLIDE AND SOLID BOX VISES.—Sizes, etc 58
ROOF COVERINGS.—Weight of various kinds 51
ROOFING SLATES.—Quantity of in any number of squares 135
ROUND AND OVAL HEAD RIVETS.—Weight of 93
RULES FOR ORDERING Metals or Wire 51
RULES FOR MEASURING Contents of Cisterns, &c 143
SASH WEIGHTS.—Weight and dimensions of 129
SEAMLESS BRASS, COPPER AND ZINC TUBING 106
" **COPPER TUBING.**—Iron Pipe sizes 119
SHEET COPPER.—Gutter and Boiler sizes 101
" " Sheathing sizes 112
SHRINKAGE OF CASTINGS.—Table of allowance 93
SLATE ROOFING.—Standard Rules for Measuring 135
SPECIFIC GRAVITY AND WEIGHT of various substances 43
STANDARD WIRE NAILS.—Lengths and gauges of 83
STEEL CROWBARS.—Sizes and weight of 112
TELEGRAPH AND TELEPHONE WIRE.—Sizes, weight and strength 78
THE METRIC SYSTEM of Weights, etc., converted into English 41
WIRE BALE TIES.—Gauges, sizes and uses 92
WIRE HOISTING ROPE.—Sizes, No.'s, Strength, etc 91



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CONTENTS.

PAGE.

ACCEPTANCES.—Rules regarding them 27
AMERICAN GRADES OF EMERY.—Cloth and Paper 73
ANCHORS.—Size required for ship's tonnage 53
APOTHECARIES' WEIGHT.—Table of 35
ARTESIAN WELL TUBES.—Weight and dimensions of 122
ATLAS POWDER.—Marks, qualities and how packed 137
" " Size of cartridges and weight in ounces 137
AVOIRDUPOIS WEIGHT.—Table of 35
AXES, BENCH.—Standard cut of each No 63
BALE TIES, WIRE.—Uses, sizes, length and gauges 92
BALLS, CAST IRON.—Weight of various sizes 69
BARBED WIRE.—Table of weights and measurements 81
BAR IRON.—Flat, weight to foot 114-115
" " Round, weight to foot 116
" " Square, weight to foot 117
" " Extra prices for each size 112
" **STEEL.**—Flat, weight to foot 126
" " Round, Square and Octagon, weight to foot 127
" **LEAD.**—Weight to foot 121
BILLS OF EXCHANGE explained 27
BLOCKS, TACKLE.—Diameter of sheaves and size of rope taken 58
BOILER TUBES.—Lap welded; weight and dimensions 122
" **IRON.**—Legal thickness required and pressure allowed 119
" " Weight of, to square foot 119
" **RIVETS.**—No. in 100 pounds 119
BOLT ENDS.—Weight of 100 124
" **HEADS.**—Standard sizes of 71
BOLTS, MACHINE.—No. to 100 pounds 124
BOXES.—Capacity of various sizes 141
BRADS, WIRE.—Standard gauges 49
BRASS, BAR AND SHEET.—Weight to foot 104
BRASS WIRE.—Weight of 100 feet 89
" **KETTLES.**—Weight and capacity of each size 103
" **TUBING.**—Weight per foot 106
" **SHEET.**—Heavy, weight to square foot 104
" **PLATES.**—Weight to square foot 105
BRAZED COPPER PIPES.—Weight to foot 106
BRAZIERS' RIVETS.—Number in a pound 103
BREAKING STRAIN upon Various Materials 113
BUTTS, BRASS.—Width when open and screws required 73
" **CAST.**—Screws required for each size 72
" **WROUGHT.**—Screws required for each size 72
BUILDERS' REFERENCE TABLE.—Size of sashes, etc 129
BUSINESS LAWS in Daily Use 24-25
BUTCHER KNIVES.—Wilson's, length of each No 65
CAPS, PERCUSSION.—Eley's "E. B." consecutive numbering 65
CAPACITY OF FREIGHT CARS 125
CAPACITY OF CISTERNS AND TANKS 143
CAPACITY OF VARIOUS BOXES AND MEASURES 141
CAST IRON COLUMNS.—Sizes and limit of strength 111
CASTERS, BED AND PLATE.—Size of wheels 65

CONTENTS.—Continued.

PAGE.

CEMENT.—For Annealing Boxes..... 30
" For Gas Retorts..... 30
" For Broken Iron Vessels..... 30
" For Closing Stove Doors..... 30
" For Filling Faults in Castings..... 30
CEMENT, RUST.—For Iron..... 30
" **FIRE-PROOF**..... 30
CHAINS, COIL.—Weight of Common and Proved to foot..... 53
" Strength of Tested..... 53
" **GERMAN.**—Wire Gauge, weight and strength..... 53
CHEMICAL SUBSTANCES expressed by common names..... 39
CIRCULAR SAWS.—Standard Gauges and directions for ordering..... 61
CISTERNS, TANKS, RESERVOIRS.—Capacity of..... 143
CISTERNS.—Capacity of in barrels and Rules for Measuring..... 143
CLOTH, WIRE.—Gauge sizes and mesh of Screen and Mill..... 80
COLUMNS, CAST IRON.—Sizes and strength..... 111
COMMON NAMES for Chemical Substances..... 39
CONDUCTIVITY ELECTRICAL.—Of various substances..... 45
COAL SCREENS.—Mesh required by dealers..... 80
COPARTNERSHIP.—Legal Requirements of..... 27
COPPER, BAR AND SHEET.—Weight to foot..... 104
COPPER, SHEET.—Gutter and Boiler, Standard sizes and weight..... 101
" " Standard sizes and weight of each sheet..... 101
" " Weight to square foot..... 101
" **PLATES.**—Weight to square foot..... 105
" **SHEATHING.**—Weight per sheet and number to case..... 112
" **RIVETS AND BURS.**—Methods of putting up..... 82
" " " " Number of each size in pound..... 103
" **WIRE.**—Weight to 100 feet..... 89
" **PIPES.**—Weight to foot..... 106
" **TUBING.**—Weight to foot..... 106
" " **PIPE SIZE.**—Weight to foot..... 107
COPPERS, SOLDERING.—Standard sizes and shapes..... 82
CORDAGE.—Number of pounds to the foot..... 55
" Approximate weight and strength..... 55
CORUNDUM.—Grades of fineness of each number..... 73
COTTERS, SPRING.—Sizes, dimensions and uses of each..... 92
CROSS TIES.—Number required to mile of track..... 125
CROWBARS.—Weight and dimensions of each size..... 63
CUBIC MEASURE.—Table of..... 37
CUT NAILS.—Length and number of each in pound..... 49
" " Extra cost of special sizes..... 82
" **SPIKES.**—Number of each in a keg..... 52
" **TACKS.**—Length and number of each in pound..... 52
CYLINDRICAL VESSELS.—Capacity of various sizes..... 141
DECIMAL EQUIVALENTS.—For parts of an inch..... 57
" " For parts of Millimeters..... 57
DRAFTS AND ACCEPTANCES.—Rules regarding them..... 27
DRAWN TUBING.—Seamless, weight to foot..... 106
DRY MEASURE.—Table of..... 37
EMERY.—Grade of fineness of each number..... 73
" **PAPER AND CLOTH.**—Comparative grading..... 73

CONTENTS.—Continued.

PAGE.

EFFECTS OF HEAT ON VARIOUS METALS.... 128
ESCUTCHEON PINS, BRASS.—Number to pound.... 126
EXCHANGE, FOREIGN.—Value of explained.... 27
EXTRA PRICES for Cut Nails and Spikes.... 51
" " for Wire Nails and Spikes.... 82
" " for Special Sizes of Bar Iron.... 112
FENCE WIRE, BARBED.—Weight and dimensions of.... 81
FILES.—Standard length, width and thickness.... 67
FREIGHT CARS.—Capacity of.... 125
FUSE, SAFETY.—Qualities and quantities.... 137
" " Quantity usually packed in a barrel.... 137
GAS PIPE, WELDED.—Weight and dimensions of.... 122
GALVANIZED SHEET IRON.—Weight to square foot, etc.... 120
GAUGES, WIRE.—Brown & Sharpe's.... 75
" " Birmingham or Stubs'.... 75
" " Washburn & Moen's.... 75
" " Trenton Iron Co.'s.... 75
" " G. W. Prentiss's.... 75
" " "Old English" from Brass Mfrs.' List.... 75
" " **STUBS'**, expressed in parts of an inch.... 80
GEOMETRICAL DEFINITIONS.... 123
GERMAN COIL CHAIN.—Wire Gauge, strength and weight to 100 feet.... 58
GLASS, WINDOW.—Number of panes in a box.... 131
GRINDSTONES.—How to obtain the weight of.... 39
GUN GAUGE, ENGLISH.—Expressed in fractions of an inch.... 65
HARD SOLDERS and process for making.... 99
HATCHETS.—Standard length of cut of each No.... 63
HATTERS' SIZES.—Table of.... 65
HEADS FOR IRON BOLTS.—Standard sizes of.... 71
HINGES, STRAP AND T,—Sizes of screws required.... 72
" " " Weight of dozen, of heavy sizes.... 72
HOOP IRON.—Number of feet in bundle.... 113
" " Wire Gauges and weight to foot.... 113
HORSE SHOES.—Weight of each size.... 59
" **SHOE NAILS.**—Length and number in a pound of each size.... 59
INCOME FROM INVESTMENTS at various costs.... 31
INTEREST LAWS throughout the United States.... 33
" **RULES** for various percentages.... 31
IRON RAILS.—Amount required for mile of track.... 125
IRON, BAND.—Number of feet in bundle.... 117
" **BAR.**—List of extras for the various sizes.... 112
" **BOILER.**—Weight to square foot.... 119
" " Legal thickness and pressure required.... 119
" **FLAT.**—Weight to running foot.... 114-115
" " Number of feet in a bundle.... 116
" **ROUND.**—Weight to running foot.... 116
" **SQUARE.**—Weight to running foot.... 117
" **HOOP AND SCROLL.**—Number of feet in bundle.... 113
" **ROUND AND SQUARE.**—Number of feet in bundle.... 117
" **SHEET AND PLATE.**—Weight to square foot.... 118
" **TIRE, IN SETS.**—Number of pounds in 54 feet.... 59
" **VALUE TO TON,** at 10ths of a cent variation.... 111

CONTENTS.—Continued.

PAGE.

IRON, SHEET RUSSIA.—Weight to square foot and per sheet..... 127
" " " Wire Gauge and number compared..... 127
" " **AMERICAN.**—Wire Gauge, weight and size in current use..... 127
" " **CALVANIZED.**—Weight per sheet and square foot..... 120
" " " Price per square foot at various discounts... 120
" **WIRE.**—Gauge, Diameter and Breaking Strain..... 77
" " Length in a bundle and 1 cwt..... 77
" " Weight of 100 yards and 1 mile..... 77
" " Sizes expressed in fractions of an inch..... 77
" " Sizes expressed in decimals of an inch..... 80
KETTLES, BRASS.—Weight and capacity of..... 103
LAG, OR WOOD SCREWS.—Weight of 100 each size..... 123
LAP-WELDED TUBES.—Sizes and dimensions of..... 122
LAWS, BUSINESS.—In every-day use.....24-25
LEAD PIPE.—Standard weights of..... 109
" **SHEET.**—Weights to square foot..... 121
" **BAR.**—Weights to lineal foot..... 121
LIGHTNING ROD TUBES.—Weight of Copper and Zinc to foot..... 106
LINEAL OR SURVEYORS' MEASURE.—Table of..... 35
LIQUID MEASURE.—Table of..... 37
LIST OF STANDARD THREADS on Bolts and Nuts..... 69
LONG MEASURE.—Table of..... 35
MACHINE BOLTS.—Number in 100 lbs..... 124
MANDRELS, CIRCULAR SAW.—Standard sizes..... 61
MATHEMATICAL RULES.—Some useful ones..... 110
MEASURES OF CAPACITY.—Table of dimensions of..... 141
METALS.—Rules for computing the weight of..... 110
" Weight of, per cubic inch and foot..... 43
" Relative malleability of..... 79
" Relative gravity of..... 79
" **AND ALLOYS.**—Specific gravity and weight of..... 43
METRIC (MICROMETER) CALIPER.—Decimal equivalents for its use... 57
METRIC SYSTEM converted to English Standards..... 41
MILL SAWS.—Standard gauges in inches..... 61
MOLASSES GATES.—Diameter and bore of each No..... 65
NAILS, CUT.—Derivation of word "Penny"..... 49
" " Number of each to pound or keg..... 49
" " Prices of all extras above 10d. rate..... 82
" **HORSE SHOE.**—Standard length and number in each pound..... 59
" **WIRE.**—Approximate number in pound..... 87
" " Differences in prices above standard..... 82
" " Standard, dimensions of each size..... 83
" " Standard gauges, No. and length..... 83
" " **AND SPIKES.**—Length and number of each in a pound..... 85
NON-CONDUCTIVITY of Various Coverings for Steam use..... 45
NUTS, WROUGHT.—Dimensions of all regular sizes..... 70
" " Number of each size in keg..... 70
OIL WELL CASING.—Standard sizes and weight..... 122
OVAL SLIDE VISES.—Size of screws, weight and length of jaws..... 58
PIPE, BLOCK TIN.—Standard weights of..... 69
" **LEAD, AND TIN-LINED.**—Standard weights of..... 109
" **GAS, WELDED.**—Weight and dimensions of..... 122

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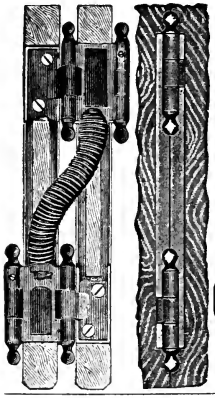

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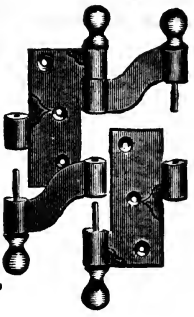

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2.50	5.50	5.50	12.00	12.00	1⅜ to 1½ in.	1.25	2.75	2.75	6.00	6.00
4.00	7.50	7.50	20.00	20.00	1¾ to 2 in.	2.00	3.75	3.75	10.00	10.00
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CONTENTS.—Continued.

PAGE.

PICKS, R. R. AND MINING.—Standard weights of 63
PLATE IRON.—Weight to square foot 118
PLATES, IRON, STEEL, COPPER, BRASS.—Weight to square foot .. 105
" **TIN.**—Wire gauge, weight, name, etc 95
POISONS AND THEIR ANTIDOTES 28
POWDER, ATLAS.—Marks, qualities, etc 137
" **SPORTING AND MINING.**—Marks and qualities 137
QUANTITIES.—A table of 35
RAILROAD SPIKES.—Number of each size in 100 lbs 52
" " Number needed to mile of track 55
RAILS, SPLICES AND BOLTS.—Required per mile of track 125
RECIPES FOR MAKING SOLDERS 99
" " " **VARIOUS CEMENTS** 30
RIVETS AND BURS, COPPER.—Number of each in a pound 103
" **BOILER, "BURDENS."**—Number of each size in a keg 119
" **ROUND OR OVAL HEAD.**—Number in a pound 93
RODS, STEEL, "STUBS."—Nos. expressed in divisions of an inch 80
ROOF COVERINGS.—Weight of, per square 51
ROOFING SLATE.—Size of and number to a square 133
" **TIN.**—Cost of, with 14x20 tin 96
" " Cost of, with 20x28 tin 97
ROPE, MANILA.—Weight per 100 fathoms 55
" " Weight per 100 fathoms of Tarred and Hawser laid 55
" " Breaking strength of each size 55
" " Number of feet to a pound of each size 55
" **WIRE.**—Diameter, circumference, weight, etc 91
RULES TO BE OBSERVED.—In ordering Metal or Wire 82
" " " In computing Slates for Roofing 135
" " " In ordering Circular Saws 61
" " " In tempering Steel 128
" **FOR COMPUTING WEIGHT** of Metals 110
" " **OBTAINING** " of Grindstones 39
" **TO CALCULATE ANY PERCENTAGE** of interest 31
RUST CEMENT for Iron 30
RUSSIA SHEET IRON.—Wire gauge, number and weight to sheet 127
SAFETY FUSE.—Qualities and burning periods 137
" " Quantity packed in each barrel 137
SASH.—Sizes and dimensions of 129
SAWS, CIRCULAR AND MILL.—Standard gauges of each 61
" " " " Directions for ordering 61
SASH WEIGHTS.—Length and thickness of each size 129
SCREENS, COAL.—Size of mesh required 80
SCREWS, LAG OR WOOD.—Weight of 100 each size 123
SCREW THREADS.—Standard, for Nuts, etc 69
SCROLL IRON.—Number of feet in a bundle 113
SEED.—Quantity usually sown to an acre 139
" Quantity required for given number of plants 139
SHEET COPPER.—Weight per square foot, and thickness by English gauge 101
" " Weight of each sheet 101
" " **AND BRASS.**—Heavy, weight in pounds 104
" **LEAD** 121
" **ZINC.**—Weight to sheet and square foot 121

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CONTENTS.—Continued.

PAGE.

SHEET IRON.—Weight to square foot 118
" " Nos. and weights in common use 127
" " **GALVANIZED.**—Price at list and discounted 120
SHOT, DROP AND BUCK.—Standard sizes and number in an ounce 109
SHRINKAGE OF CASTINGS.—Rules for pattern-makers 93
SKATES.—Sizes in inches compared with Shoe sizes 65
SLATE ROOFING.—Standard rule for measuring 135
" " Table showing No. of slate in any No. of squares 135
" " Weight to square and cubic foot 133
SOLID BOX VISES.—Length of jaws of each size 58
" " " Sizes of boxes and screws 58
SOLDERS, HARD AND SOFT.—Recipes for making 99
SOME THINGS THAT ARE MISNAMED 47
SPECIFIC GRAVITY and Weight of Metals and Alloys 43
SPIKES, CUT.—Number of each size in a keg 52
" **RAILROAD, BOAT AND SHIP.**—Number of each size in a keg. 52
" " Number needed to mile of track 55
" " Sizes used to various weights of rail 55
SQUARE MEASURE.—Table of 37
STATUTES OF LIMITATION for Debt in U. S. 33
STEEL, BAR.—Round, Square and Octagon, weight to foot 127
" " **FLAT.**—Weight to foot 126
" **PLATES.**—Weight to square foot 105
" **WIRE.**—Weight to 100 feet 89
" " **RODS.**—Nos. expressed in parts of an inch 80
STEEL CROWBARS.—Weight and dimensions of 112
STRAP AND T HINGES.—Weight of heavy sizes to dozen 72
" " " Sizes of screws required 72
SURVEYING (LINEAL) MEASURE.—Table of 35
TACKLE BLOCKS.—Size of sheaves and rope required for each 58
TACKS, CUT.—No. of each size in pound 49
TANKS AND RESERVOIRS.—Capacity of 143
TAPER AND PLUG TAPS.—No. of threads to inch 70
TELEGRAPH AND TELEPHONE WIRE 78
TENSILE STRENGTH and Resistance of Metals 79
THREADS, STANDARD.—List of, for Bolts and Nuts 69
TIN-LINED PIPES.—Standard size of 109
TIN PLATES.—Standard kinds and sizes 95
" " Weight, wire gauge, and No. of sheets in a box 95
" **ROOFING.**—Cost per square, at various rates per box 96-97
TIRE IRON.—Weight per set of each size 59
TIRE STEEL.—Weight per set of each size 59
TEMPERING STEEL.—Rules to be observed 128
TROY WEIGHT.—Table of 35
TUBES, BOILER.—Weight and dimensions of 122
" **ARTESIAN WELL.**—Weight and dimensions of 122
TUBING, BRASS, COPPER AND ZINC.—Weight to foot 106
" **COPPER.**—Pipe sizes, weight to foot 107
USEFUL MATHEMATICAL RULES 110
USE OF WIRE in Telegraph Service 78
VALUE OF IRON to the Ton at a given price per pound 111
VISES, OVAL SLIDE.—Weight, size of screws and length of jaws 58

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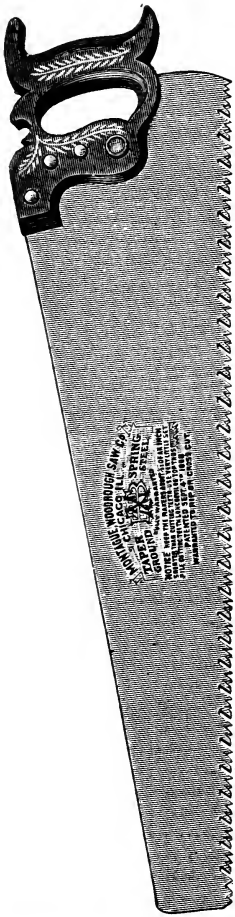

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CONTENTS.—Continued.

PAGE.

VISES, SOLID BOX.—Sizes of boxes and screws 58
" " " Weight and length of jaws 58
WASHERS.—Standard sizes and No. of each in a keg 71
WEIGHTS AND MEASURES.—Complete Tables of 35–37
" " " The Metric System in English 41
WEIGHTS, SASH.—Length and thickness of each size 129
WEIGHT TO A CUBIC FOOT of various Metals and Alloys 43
WEIGHT OF ROOF COVERINGS per Square 51
WINDOW GLASS.—No. of panes in a box of each size 131
WILSON'S BUTCHER KNIVES.—Length of each No 65
WIND.—Velocity and force of 139
WIRE BALE TIES.—Uses, sizes, length and gauges 92
WIRE BRADS.—Standard Length and Gauge 49
" **CLOTH.**—Sizes and mesh of Screen and Mill 80
" **FENCE.**—Number of wires and distances between posts 81
" **GAUGES.**—Different Standards in the United States 75
" **HOISTING ROPE.**—Diameter, circumference, weight, etc 91
" **ROPE.**—Trade Nos., diameter, circumference, weight, etc 91
WIRE, BARBED FENCE.—Weight and measurement of 81
" **BRASS.**—Weight to 100 feet, in pounds 89
" **COPPER.**—Weight to 100 feet, in pounds 89
" **IRON.**—Weight to 100 feet, in pounds 89
" " Size, weight, length and strength 77
" " Size by wire gauge, expressed in decimals of an inch 80
" **STEEL.**—Weight to 100 feet, in pounds 89
" **TELEGRAPH AND TELEPHONE.**—Weight, resistance, strength 78
WIRE NAILS.—Approximate number of Regular in a pound 87
" " Approximate number of Standard in a pound 85
" " Extra prices for various sizes 82
" " Length of each Standard size and kind 83
" " **AND SPIKES.**—Size, length and number of each in pound ... 83
WIRES OF VARIOUS METALS.—Tensile strength and resistance 79
WORKSHOP RECIPES.—Various kinds of Cement 30
WROUGHT BOAT AND SHIP SPIKES.—Number in 150 pounds 52
WRENCHES, "COE'S."—Size of Nut taken by each length 63
ZINC, SHEET.—Wire gauge, number and weight to sheet 121
" **TUBING.**—Weight per foot, ... 106

BUSINESS LAW IN DAILY USE.

The following compilation of business law contains the essence of a large amount of legal verbage:

If a note is lost or stolen, it does not release the maker; he must pay it, if the consideration for which it was given and the amount can be proven.

Notes bear interest only when so stated.

Principals are responsible for the acts of their agents.

Each individual in a partnership is responsible for the whole amount of the debts of the firm, except in cases of special partnership.

Ignorance of the law excuses no one.

The law compels no one to do impossibilities.

An agreement without consideration is void.

A note made on Sunday is void.

Contracts made on Sunday cannot be enforced.

A note by a minor is void.

A contract made with a minor is void.

A contract made with a lunatic is void.

A note obtained by fraud, or from a person in a state of intoxication, cannot be collected.

It is a fraud to conceal a fraud.

Signatures made with a lead pencil are good in law.

A receipt for money is not always conclusive.

The acts of one partner bind all the rest.

"Value received" is usually written in a note, and should be, but is not necessary. If not written it is presumed by the law, or may be supplied by proof.

The maker of an "accommodation" bill or note (one for which he has received no consideration, having lent his name or credit for the accommodation of the holder) is not bound to the person accommodated, but is bound to all other parties, precisely as if there was a good consideration.

No consideration is sufficient in law if it be illegal in its nature.

Checks or drafts must be presented for payment without unreasonable delay.

Checks or drafts should be presented during business hours, but in this country, except in the case of banks, the time extends through the day and evening.

If the drawee of a check or draft has changed his residence, the holder must use due or reasonable diligence to find him.

If one who holds a check as payee or otherwise, transfers it to another, he has a right to insist that the check be presented that day, or, at farthest, on the following day.

A note indorsed in blank (the name of the indorser only written) is transferable by delivery, the same as if made payable to bearer.

If the time of payment of a note is not inserted, it is held payable on demand.

BUSINESS LAW IN DAILY USE.----Continued.

The time of payment of a note must not depend upon a contingency. The promise must be absolute.

A bill may be written upon any paper, or substitute for it, either with ink or pencil.

The payee should be distinctly named in the note, unless it is payable to bearer.

An indorsee has a right of action against all whose names were on the bill when he received it.

If the letter containing a protest of non-payment be put into the post office, any miscarriage does not affect the party giving notice.

Notice of protest may be sent either to the place of business or of residence of the party notified.

The holder of a note may give notice of protest either to all the previous indorsers or only to one of them; in case of the latter he must select the last indorser, and the last must give notice to the last before him, and so on. Each indorser must send notice the same day or the day following. Neither Sunday or legal holiday is to be counted in reckoning the time in which notice is to be given.

The loss of a bill or note is not sufficient excuse for not giving notice of protest.

If two or more persons as partners are jointly liable on a note or bill, due notice to one of them is sufficient.

If a note or bill is transfered as security, or even as payment of a pre-existing debt, the debt revives if the bill or note be dishonored.

An indorsement may be written on the face or back.

An indorser may prevent his own liability to be sued by writing "without recourse," or similar words.

All claims which do not rest upon a seal or judgment must be sued within six years from the time when they arise.

Part payment of a debt which has passed the time of statutory limitation revives the whole debt, and the claim holds good for another period of six years from the date of such partial payment.

A verbal promise to pay, made without condition, is generally held as sufficient to revive a claim otherwise shut out by the law of limitation.

If, when a debt is due, the debtor is out of the State, the "six years" do not begin to run until he returns. If he afterward leave the State, the time forward counts the same as if he remained in the State.

An oral agreement must be proved by evidence. A written agreement proves itself. The law prefers written to oral evidence because of its precision.

No evidence may be introduced to contradict or vary a written contract; but it may be received in order to explain it, when such contract is in need of explanation.

SPECIAL NOTICE TO THE TRADE.

EUREKA FIRE HOSE COMPANY,

13 Barclay Street, New York,

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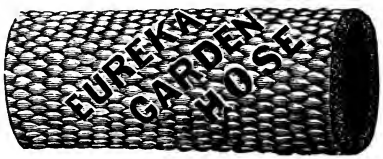
Seamless Cotton and Mildew-Proof, Rubber-Lined

"EUREKA GARDEN HOSE."



This Company for the season's trade in **Garden Hose** invites the especial attention of dealers, and solicits their orders for our products of Hose for Household purposes. This Hose is known as the **Eureka Garden Hose,** which we have greatly improved in appearance and weaving—unequalled by any and the very best Hose in the market.

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It is superior to the best Rubber Hose for durability and strength. It is Mildew-Proof and will stand over 500 lbs. pressure per square inch and outlasts Rubber Hose many times over.

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THE EUREKA GARDEN HOSE

cannot be injured by exposure to sun, same as Rubber Hose.

—PRICE LIST:—

½	Inch	Eureka	Garden	Hose	.....	20	Cents	per	Foot.
¾	"	"	"	"	.....	25	"	"	"
1	"	"	"	"	.....	35	"	"	"

SEND FOR SAMPLES.

Subject to Liberal Discount to the Trade. Couplings attached and Pipes Furnished when Required.

SPECIAL NOTICE.

For the past ten years we have had this brand of Hose in the market, which has proven a Great Success, **Millions of Feet Being Sold.**

The Success of the Eureka Fire Hose Company's Garden Hose is due to the fact of the excellence of the material used in the manufacture, and also to its being treated mildew-proof, which is of vital importance to the success and durability of Cotton Hose.

To Insure getting a Perfect Garden Hose, see that each length bears the brand of

"Eureka Garden Hose," and accept none other.

Respectfully, **EUREKA FIRE HOSE CO.**

Bills of Exchange, Drafts, Acceptances.

A Bill of Exchange or Draft is an order drawn by one person or firm upon another, payable either at sight or at a stated future time.

It becomes an "Acceptance" when the party upon whom it is drawn writes across the face "Accepted," and signs his name thereto, and is negotiable and bankable the same as a note, and subject to the same laws.

In many States both Sight and Time drafts are entitled to three days grace, the same as notes; but if made in form of a bank check, "pay to," without the words "at sight," it is payable on presentation without grace.

Demand Notes are payable on presentation without grace, and bear legal interest, after a demand has been made, if not so written. An endorser on a demand note is holden only for a limited time, variable in different States.

A Negotiable Note must be made payable either to bearer, or be properly endorsed by the person to whose order it is made. If the endorser wishes to avoid responsibility, he can endorse "without recourse."

A Joint Note is one signed by two or more persons, who each become liable for the whole amount.

Three Days' Grace are allowed on all time notes, after the time for payment expires; if not then paid, the endorser, if any, should be legally notified, to be holden.

Foreign Exchange, Value of U. S. Coins, etc.

The value of One Pound Sterling or an English Sovereign, compared with old U. S. coins, is $4.444, but Congress has, from time to time, reduced the weight and purity of U. S. coins, making their value as metals less than their value as coins, and has established the present legal value of a Pound Sterling at $4.84. Exchange is based on the old or nominal value of a Pound, so that when exchange is said to be at 9 per cent. premium, it is then at par value; when below 9 per cent., it is below par; and when above 9 per cent., above par, etc.

Copartnerships.

Partnerships may be either general or special. In general partnerships, money invested ceases to be individual property. Each member is made personally liable for the whole amount of debts incurred by the company. The company is liable for all contracts or obligations made by individual members.

Special Partners are not liable beyond the amount contributed.

A person may become a partner by allowing people generally to presume that he is one, as, by having his name on the sign, or parcels, or in the bills used in the business.

A share or specific interest in the profits or loss of a business, as remuneration for labor, may involve one in the liability of a partner.

In case of Bankruptcy, the joint estate is first applied to the payment of partnership debts, the surplus only going to the creditors of the individual estate.

A Dissolution of partnership may take place under express stipulations in the articles of agreement, by mutual consent, by the death or insanity of one of the firm, by award of arbitrators, or by court of equity in cases of misconduct of some member of the firm

A partner signing his individual name to negotiable paper, which is for the use of the partnership firm, binds all the partners thereby. Negotiable paper of the firm, even though given on private account by one of the partners, will hold all the partners of the firm when it passes into the hands of holders who are ignorant of the fact attending its creation.

Partnership effects may be bought and sold by a partner; he may make contracts; may receive money; endorse, draw, and accept bills and notes; and while this may be for his own private account, if it apparently be for the use of the firm, his partners will be bound by his action, provided the parties dealing with him were ignorant of the transaction being on his private account; and thus representation or misrepresentation of a partner, having relation to business of the firm, will bind the members in the partnership.

In case of Death, the surviving partners must account to the representatives of the deceased.

Poisons and their Antidotes.

ARSENIC.—Use the stomach pump instantly; otherwise, give 20 grains sulphate of zinc in a little warm water to produce vomiting, or a large table spoonful of mustard in warm water. Meanwhile procure some *hydrated sesquioxide of iron* and give a tablespoonful of it with water every five or ten minutes until six doses are taken. *Dialyzed iron* is also efficient.

AQUA AMMONIA, or HARTSHORN, if taken undiluted is a violent poison. Give *Vinegar*, instantly, mixed with a little water, this acts by neutralization. Vegetable oils, in large quantity, furnish the next best antidote, the ammonia acting upon them to form Soap.

ACONITE.—Give an emetic of mustard or sulphate of zinc, or use the stomach pump, instantly, then give stimulants, whiskey, brandy, gin or rum, &c.

ACID—NITRIC, MURIATIC, or SULPHURIC.—If either of these be swallowed, not a moment is to be lost. The best remedy is to fill the patient FULL of *Calcined Magnesia* stirred up in water, to the consistency of very thin paste; or, give half an ounce of soap shavings in a pint of water. If neither are at hand give chalk or whiting, in water, or even pound fine some of the white plastering from the wall and give in water

BELLADONNA, HYOSCYAMUS, STAMONIUM, and CONIUM are all narcotics, and the treatment is the same as for opium; *especially the strong coffee.*

CANTHARIDES (Spanish Flies).—Give large doses of sweet oil, sugar and water, or milk. To relieve the strangury and scalding of urine whice it occasions, give camphor, 10 to 15 drop doses in water.

CORROSIVE SUBLIMATE, (Bed bug poison).—Mix up quickly the *whites of a dozen eggs*, with a quart of cold water, give a cupful of the mixture every two minutes till the stomach can hold no more. If you have not eggs enough use what you have and make up the deficiency with *milk*. Wheat flour, mixed with water, is good. Use the stomach pump if it can be had quickly.

CHARCOAL GAS, SULPHURETTED HYDROGEN, or CARBONIC ACID GAS.—Use cold shower bath and give Aconite in drop doses, in a spoonful of water. The effects of *Coal gas* are best antidoted by copious draughts of vinegar and water.

OXALIC ACID.—Give *Magnesia* in water as quickly as possible. When not to be had, use chalk, lime or saleratus. Use the stomach pump if at hand. Soap suds or alkalies are of no use with this Acid.

OPIUM, MORPHINE and LAUDANUM.—Use the stomach pump, if possible; if not, a powerful emetic, as sulphate of zinc; or, give the mustard emetic and tickle the palate. If drowsiness comes on, take the patient into the open air; dash water into the face, *by all means keep him walking.* If once allowed to fall asleep it may be impossible to arouse him. Strong coffee, taken hot, antidotes after the stomach has been emptied.

PRUSSIC ACID.—This is the deadliest of all known poisons. One drop of the *pure acid* will cause instantaneous death. If any of its products be taken and the result is not immediately fatal, resort to the cold shower bath, inhalation of diluted *aqua ammonia* vapor and give solution of carbonate of potass, 20 grains to a glass of water, or ammonia diluted with six times the bulk of water, freely.

SUGAR OF LEAD, (Acetate of Lead).—Give a ground mustard emetic; or, 20 grains sulphate of zinc in a glass of water; afterwards, large dose of epsom salts.

STRYCHNINE or NUX VOMICA, are rapid and deadly poisons, generally proving fatal, in spite of treatment. If emetics are given and the stomach emptied quickly enough, and if the patient is not attacked with convulsions within two hours, he will generally be safe. An abundance of sweet milk is recommended, also strong coffee, as for opium poisoning.

STRONG LYE.—Sometimes swallowed by children. The remedy is *vinegar, or oil*, the former by converting the lye into acetate of potash, the latter by forming soap; neither of which materially injures the stomach.

VERDIGRIS.—This most frequently poisons by its formation upon copper vessels used in cooking. Give an *emetic* instantly, and then two teaspoonfuls of *Carbonate of Soda*, in a tumbler full of water and repeat in ten minutes. Whites of eggs in water are also proper.

PERFECTION.

BUSHNELL'S PRICE BOOK,

For the Convenience of Business Men

IN ALL LINES OF TRADE,

BUT ESPECIALLY THE HARDWARE DEALER.

This Book was not offered to the Public until October, 1883, but thousands who are now using it can testify to its usefulness.

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BUSHNELLS' PRICE BOOK is a neat, substantially bound book of 200 pages, made of first-class stock, conveniently and tastefully indexed, handsomely ruled and headed. It is manufactured for the publisher by one of the best blank book manufacturers in New York, and no expense has been spared to make it the finest book in the market, the neatness and convenience of which will commend it at once.

There is no other price book in the market, sold at anything like an equal figure, that compares with it. It was developed by years of experience in business, and the need of a *practical* price book was the means of bringing this before the public.

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WORKSHOP RECIPES.

Cement to Resist Fire and Water, and Harden Quickly.

Two parts finely sifted unoxodized iron filings.
One part, perfectly dry, finely powdered loam.
Knead the mixture with strong vinegar into a homogeneous plastic mass, to be used as soon as made.

To Soften Putty.

To remove old putty from broken windows, dip a small brush in nitro-muriatic acid or caustic soda (concentrated lye), and with it annoint or paint over the dry putty that adheres to the broken glass and frames of your windows; after an hours interval, the putty will have become so soft as to be easily removable.

Painter's Putty.

Spanish whiting, pulverized.....	80.6	Made into a stiff paste. If not intended for immediate use, raw oil should be used.
Boiled Oil.....	20.4	

One pound of putty for stopping every 20 yards.

Glazier's Putty.

Whiting, 70 pounds; boiled oil, 30 pounds; water, 2 gallons. Mix. If too thin add more whiting; if too thick, add more oil.

Cement for Stopping Joints, Etc.

White lead in oil, mixed with enough white sand to make it a stiff paste. This grows hard by exposure, and resists heat, cold and water.

Cement for Leather Belting.

Take of common glue and American isinglass, equal parts; place them in a boiler and add water sufficient to cover the whole. Let it soak 10 hours, then bring it to a boiling heat, and add pure tannin until the whole becomes ropey or appears like the whites of eggs. Apply it warm. Buff the grain off the leather where it is to be cemented; rub the joint surfaces solidly together, let it dry a few hours, and it is ready for practical use; and, if properly put together, it will not need riveting, as the cement is nearly of the same nature as the leather itself.

To Remove Rusty Bolts.

To remove bolts that have become rusted badly, without breakiug them, is quite simple if understood. The best method is to apply kerosene oil liberally, and give time for it to soften the rust before any attempt is made to turn the nut. If, after the rust has softened, it does not start easily with the wrench, give a rap on one corner with a blow of the hammer. A hammer and cold chisel rightly used will often start a rusted nut that would not yield to the wrench without twisting off the bolt.

How to Prepare Fence Posts.

A western farmer says that he discoverd many years ago that wood could be made to last longer than iron in the ground. Time and weather, he says, seem to have no effect on it. Posts can be prepared for less than two cents apiece. This is the recipe: Take boiled linseed oil and stir it in pulverized charcoal to the consistency of paint. Put a coat of this over the timber, and, he adds, there is not a man that will live to see it rot.

A Practical Rule for Laying Pipe for Draining Land.

Soils.	Depth of Pipe.	Distance apart.
Coarse Gravel Sand.....	4 feet 6 inches.....	60 feet.
Light Sand with Gravel.....	4 "	50 "
Light Loam.....	3 " 6 "	33 "
Loam with Clay.....	3 " 2 "	21 "
" " Gravel.....	3 " 3 "	27 "
Sandy Loam.....	3 " 9 "	40 "
Soft Clay.....	2 " 9 "	21 "
Stiff "	2 " 6 "	15 "

Greatest Fall of Rain is 2 inches per hour=54303.6 galls. per acre.

Rate of Annual Income of Investments,

PAR VALUE BEING $100, BEARING INTEREST AT

Price paid.	5%	6%	7%	8%	10%
$50	10.00	12.00	14.00	16.00	20.00
55	9.09	10.90	12.72	14.55	18.18
60	8.33	10.00	11.66	13.33	16.66
65	7.69	9.23	10.76	12.30	15.38
70	7.14	8.57	10.00	11.42	14.28
75	6.66	8.00	9.33	10.66	13.35
80	6.25	7 50	8.75	10.00	12.50
82½	6.06	7.27	8.48	9.69	11.12
85	5.88	7.05	8.23	9.41	11.76
87½	5.71	6.85	8.00	9.14	11.42
90	5.55	6.66	7.77	8.88	11.11
92½	5.40	6.48	7.56	8.64	10.80
95	5.26	6.31	7.36	8.42	10.52
96	5.20	6.25	7.29	8.33	10.41
97	5.15	6.18	7.21	8.24	10.30
97½	5.12	6.15	7.17	8.20	10.25
98	5.10	6.12	7.14	8.16	10.20
99	5.05	6.06	7.07	8.08	10.10
100	5.00	6.00	7.00	8.00	10.00
101	4.95	5.94	6.93	7.92	9.90
102	4.90	5.88	6.86	7.84	9.80
103	4.85	5.82	6.79	7.76	9.70
104	4.80	5.76	6.73	7.69	9.61
105	4.76	5.71	6.66	7.61	9.52
110	4.54	5.45	6.36	7.27	9.09
115	4.34	5.21	6.08	6.95	8.69
120	4.16	5.00	5.83	6.66	8.33
125	4.00	4.80	5.60	6.40	8.00
130	3.84	4.61	5.38	6.15	7.69
135	3.70	4.44	5.18	5 92	7.40
140	3.57	4.28	5.00	5.71	7.14
145	3.44	4.13	4.82	5.51	6.89
150	3.33	4.00	4.66	5.33	6.66

Interest Rules.

FOUR PER CENT.—Multiply the principal by the number of days to run; separate the right hand figure from product, and divide by 9.

FIVE PER CENT.—Multiply by number of days, and divide by 72.

SIX PER CENT.—Multiply by number of days; separate right hand figure, and divide by 6.

SEVEN AND THREE-TENTHS PER CENT.—Multiply by number of days, and double the amount so obtained. On $100 the interest is just two cents per day.

EIGHT PER CENT.—Multiply by number of days, and divide by 45.

NINE PER CENT.—Multiply by number of days; separate right hand figure, and divide by 4.

TEN PER CENT.—Multiply by number of days, and divide by 36.

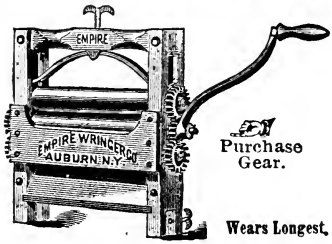
TWELVE PER CENT.—Multiply by number of days; separate right hand figure, and divide by 3.

Interest Laws and Statutes of Limitations.

STATES AND TERRITORIES.	INTEREST LAWS.		STATUTES OF LIMITATIONS.			STATES AND TERRITORIES.	INTEREST LAWS.		STATUTES OF LIMITATIONS.		
	Legal rate.	Rate allow'd by contract.	Judgments, Years.	Notes, Years.	Open acct's Years.		Legal rate.	Rate allow'd by contract.	Judgments, Years.	Notes, Years.	Open acct's, Years.
	per cent.	*per cent.*					*per cent.*	*per cent.*			
Alabama	8	8	20	6	3	Missouri	6	10	10	10	5
Arkansas	6	10	10	5	3	Montana	10	Any rate.	6	6	2
Arizona	10	Any rate.	4	4	2	Nebraska	7	10	5	5	4
California	7	Any rate.	5	4	2	Nevada	10	Any rate.	6	6	4
Colorado	10	10	6	6	6	New Hampshire	6	6	20	6	6
Connecticut	6	†	16	16	6	New Jersey	6	6	20	6	6
Dakota	7	12	6	6	6	New Mexico	6	12	15	6	4
Delaware	6	6	20	6	3	New York	6	6*	20	6	6
Dist. of Columbia	6	10	12	3	3	North Carolina	8	8	10	3	3
Florida	8	Any rate.	20	3	2	Ohio	6	8	5	15	6
Georgia	7	8	7	6	4	Oregon	8	10	10	6	1
Idaho	10	18	6	5	4	Pennsylvania	6	6	5	6	6
Illinois	6	8	7	10	5	Rhode Island	6	Any rate.	20	6	6
Indiana	6	6	10	10	6	South Carolina	7	10	20	6	6
Iowa	7	10	20	10	5	Tennessee	6	6	10	6	6
Kansas	7	12	5	5	3	Texas	8	12	15	4	2
Kentucky	6	6	15	15	5	Utah	10	Any rate.	5	4	2
Louisiana	5	8	10	5	3	Vermont	6	6	8	6	6
Maine	6	Any rate.	20	6	6	Virginia	6	12	10	5	2
Maryland	6	6	12	3	3	Washington Terr'y.	10	Any rate.	6	6	3
Massachusetts	6	Any rate.	20	6	6	West Virginia	6	†	10	10	5
Michigan	7	10	6	6	6	Wisconsin	7	10	20	6	6
Minnesota	10	Any rate.	10	6	6	Wyoming	8	Any rate.	5	5	4
Mississippi	6	10	7	6	3						

*New York has by a recent law legalized any rate of interest on call loans of $5000 or upwards, on collateral security.
†No usury, but over 6 per cent. cannot be collected by law.

EMPIRE "PURCHASE GEAR" WRINGERS



Purchase Gear.

Wears Longest.

SAVE MUCH MORE LABOR

AND

ARE MORE DURABLE THAN OTHERS.

MADE IN ALL SIZES.

ADAPTED FOR FAMILIES, HOTELS AND LAUNDRIES.

EMPIRE CLOTHES DRYERS.

Require small space and have large capacity.

Fold up against the wall when not in use.

Closed. Open for Use.

THE "DAISY" WRINGER.

SIMPLE,
EFFICIENT,
DURABLE.

Solid White Rubber Rolls.

Dealers, write for Catalogue of Wringers (all kinds,) also Folding Wash Benches, Clothes Dryers, Cot Beds, Hammock Standards, Swings, etc., etc., to

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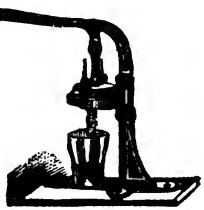
LEVER LEMON SQUEEZER.



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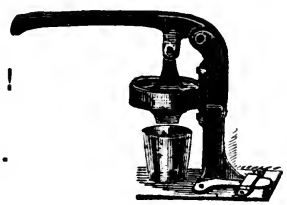
A FRUIT AND VEGETABLE PRESSER and CUP STRAINER

A New and Important Invention.

It Can be Used for More than 100 Different Purposes in the Kitchen.

NEW IMPROVED LIME PRESSER.

The Cheapest Ever Put Upon the Market!



R. ONDERDONK,

405 GRAND ST., NEW YORK.

Factory: Mt. Vernon, N. Y.

WEIGHTS AND MEASURES.

Avoirdupois Weight.

The Grain is the same in Troy, Apothecaries and Avoidupois Weights.

The standard avoirdupois pound is the weight of 27.7015 cubic inches of distilled water weighed in the air at 35.85 degrees Fahr., barometer at 30 inches.

27.343 grains = 1 drachm.

drachms.	ozs.	lbs.	qrs.	cwt.	ton.	French grammes.
1 =	.0625 =	.0039 =	.000139 =	.000035 =	.00000174 =	1.771846
16 =	1 =	.0625 =	.00223 =	.000558 =	.000028 =	28.34954
256 =	16 =	1 =	.0357 =	.00893 =	.000447 =	453.59
7168 =	448 =	28 =	1 =	.25 =	.0125 =	12700
28672 =	1792 =	112 =	4 =	1 =	.05 =	50802
573440 =	35840 =	2240 =	80 =	20 =	1 =	1016040

A stone = 14 pounds. A quintal = 100 pounds

Troy Weight.

For Gold, Silver and Precious Metals.

grains.	dwts.	ozs.	lbs.	French grammes.
1 =	.04167 =	.00208 =	.0001736 =	.9648
24 =	1 =	.05 =	.004167 =	1.555
480 =	20 =	1 =	.0833 =	31.1035
5760 =	240 =	12 =	1 =	373.242

175 lbs. Troy = 144 Avoirdupois.
lbs. Avoirdupois X .82286 = lbs. Troy.
lbs. Troy X 1.2153 = lbs. Avoirdupois.

The jeweler's Carat is equal, in the United States, to 3.2 grains; in London, to 3.17 grains; in Paris, to 3.18.

Pure Gold is worth $20.67 per oz. Troy, or $1.24 per oz. Avoirdupois.
" Silver " $1.36 " " $1.24 " "
Standard Gold " $18.60 " " $16.96 " "
" Silver " $1.225 " " $1.117 " "

Apothecaries' Weight.

United States and British.

20 grains..... 1 scruple.
3 scruples..... 1 drachm = 60 grains.
8 drams..... 1 ounce = 24 scruples = 480 grains.
12 ounces..... 1 pound = 96 drachms = 288 scruples = 5760 grs.

In Troy and Apothecaries' weights, the grain, ounce and pound are the same.

Long Measure.

ins.	feet.	yards.	fath.	poles.	furl.	mile.	French metres.
1 =	.083 =	.02778 =	.0139 =	.005 =	.000126 =	.0000158 =	.0254
12 =	1 =	.333 =	.1667 =	.0606 =	.00151 =	.0001894 =	.3048
36 =	3 =	1 =	5 =	.182 =	.00454 =	.000568 =	.9144
72 =	6 =	2 =	1 =	.364 =	.0091 =	.001136 =	1.8287
198 =	16½ =	5½ =	2¾ =	1 =	.025 =	.003125 =	5.0291
7920 =	660 =	220 =	110 =	40 =	1 =	.125 =	201.16
63360 =	5280 =	1760 =	880 =	320 =	8 =	1 =	1609.315

A cable's length = 120 fathoms.

A square mile is 640 acres.
A league is three miles.
The term "Sabbath Day's Journey" means 1,155 yards.
A day's journey is 33⅓ miles.
A fathom is six feet.

A hand (horse measure) is four inches.
A palm is three inches.
A span is 10⅞ inches.
A cubit is two feet.
A great cubit is 11 feet.
A pace is three feet.

Surveying Measure (Lineal).

ins.	links.	feet.	yards.	chains.	mile.	French metres.
1 =	.126 =	.0833 =	.0278 =	.00126 =	.0000158 =	.0254
7.92 =	1 =	.66 =	.22 =	.01 =	.000125 =	.2012
12 =	1.515 =	1 =	.333 =	.01515 =	.000189 =	.3048
36 =	4.545 =	3 =	1 =	.04505 =	.000568 =	.9144
792 =	100 =	66 =	22 =	1 =	.0125 =	20.116
63360 =	8000 =	5280 =	1760 =	80 =	1 =	1609.315

1 knot or geographical mile = 6082.66 feet = 1854 metres = 1.152 statute mile.
1 Admiralty knot = 1.1515 statute miles = 6080 feet.

Table of Quantities.

12 units or articles,	1 dozen.	20 quires	1 ream.
12 dozen	1 gross.	2 reams	1 bundle.
20 units or articles,	1 score.	5 bundles	1 bale.
24 sheets paper,	1 quire.	Printer's token,	250 sheets.

NORTHAMPTON CUTLERY CO.,

New York Salesroom, - 122 Chambers St., Only.

Office and Factory, Northampton, Mass.

MANUFACTURERS OF

SUPERIOR TABLE CUTLERY

Of Every Description.

With Cocoa, Ebony, Bone, Rubber, Celluloid, Ivory and Plated Handles, including an Assortment of

CARVERS AND PATENT GUARD FORKS

Of the Latest and Most Approved Designs.

FRENCH COOKS' KNIVES

Tempered and Ground especially for Professional Use.

BUTCHER, HUNTING, STICKING AND SKINNING

KNIVES,

In all the usual styles of perfect finish and guaranteed quality.

A full assortment of these very desirable Goods can be obtained from

ANY OF THE LEADING JOBBING HOUSES IN THE UNITED STATES

WEIGHTS AND MEASURES—Continued.

Square Measure.

ins.	feet.	yards.	perches.	roods.	acre.	Square metres.
1 =	.00694 =	.000772 =	.0000255 =	.00000064 =	.000000159 =	.000645
144 =	1 =	.111 =	.00367 =	.0000918 =	.000023 =	.0929
1296 =	9 =	1 =	.0331 =	.000826 =	.0002062 =	.8361
39204 =	272¼ =	30¼ =	1 =	.025 =	.00625 =	25.292
1568160 =	10890 =	1210 =	40 =	1 =	.25 =	1011.7
6272640 =	43560 =	4840 =	160 =	4 =	1 =	4046.7

100 square feet = 1 square.
1 chain wide = 8 acres per mile.
10 square chains = 1 acre.
1 hectare = 2.471143 acres.
1 square mile. = 27878400 sq. feet. = 3097600 sq. yds. = 640 acres.
Acres x .0015625 = square miles.
Sq. yds. x .000000323 = sq. miles.

A section of land is 1 mile square, and contains 640 acres

A square acre is 208.71 feet at each side.
" ½ " 147.58 " "
" ¼ " 104.355 " "

A circular " 235.504 feet in diameter.
" ½ " 166.527 " "
" ¼ " 117.752 " "

52 1-6 feet square, or..... 2,722½ square feet is 1-16 acre.
73⅔ feet square, or..... 5,445 square " " ⅛ acre.
104⅙ feet square, or.....10,890 square " " ¼ acre.
120⅔ feet square, or.....14,520 square " " ⅓ acre.
147⅓ feet square, or.....21,780 square " " ½ acre.
208⅔ feet square, or.....43,560 square " " 1 acre.

Cubic Measure.

ins.	feet.	yard.	cubic metres.
1 =	.0005788 =	.000002144 =	.000016386.
1728 =	1 =	.03704 =	.028315
46656 =	27 =	1 =	.764513

A cord of wood = 128 cubic feet, being 4 feet high, 4 feet wide, and 8 feet long.
42 cubic feet = a ton of shipping.

A CUBIC FOOT IS EQUAL TO

1728 cubic inches.
.037037 cubic yard.
.803564 U. S. struck bushel of 2150.42 cubic inches.
3.21426 U. S. pecks.
7.48052 U. S. liquid galls. of 231 cub. inch.
6.42851 U. S. dry gallons.
29.92208 U. S. liquid quarts.
25.71405 U. S. dry quarts.
59.84416 U. S. liquid pints.
51.42809 U. S. dry pints.
239.37662 U. S. gills.
26667 flour barrel of 3 struck bushels.
23745 U. S. liquid barrel of 31½ gallons.

Dry Measure.

The Standard Bushel contains 2150.42 cubic inches, or 77.627013 pounds avoirdupois of pure water at maximum density. It legal dimensions are 18½ inches Diameter inside, 19½ inches outside, and 8 inches deep; and when heaped, the cone must be 6 inches high, making a heaped bushel equal to 1¼ struck ones.

Pints.	Quarts.	Gallons.	Pecks.	Bushels.	Cubic Inches.
2 =	1 =	.250 =	.125 =	.0315 =	67.2
8 =	4 =	1 =	.5 =	.125 =	268.8
16 =	8 =	2 =	1 =	.25 =	537.6
64 =	32 =	8 =	4 =	1 =	2150.42

Liquid Measure.

The standard gallon measures 231 cubic inches, or 8.33888 lbs., avoirdupois of pure water, at about 39.85 degrees Fahr., the barometer at 30 inches.

gills.						
4 =	1 pint.					
8 =	2 =	1 quart.				
32 =	8 =	4 =	1 gallon.			
1344 =	336 =	168 =	42 =	1 tierce.		
2016 =	504 =	252 =	63 =	1½ =	1 hogshead.	
2688 =	672 =	336 =	84 =	2 =	1½ =	1 puncheon.
4032 =	1008 =	504 =	126 =	3 =	2 =	1½ = 1 pipe.
8064 =	2016 =	1008 =	252 =	6 =	4 =	3 = 2 = 1 tun.

A cubic foot contains 7½ gallons.

JOHNSTON'S

STANDARD DRY SIZED

KALSOMINE AND FRESCO PAINTS.

Gold Medal, New Orleans, 1884-5, and Eight First-Class Awards.

CHEAPER THAN WALL PAPER OR OIL PAINT.

READY

FOR USE

- Pure White and Beautiful Tints.
- Purifies and Beautifies.
- Will not Rub and Scale from the Wall.
- Invaluable in Cleansing and Disinfecting Walls Impregnated with Germs of Disease.
- Mixed in 5 Minutes Ready for the Brush, by the addition of Water Only.
- An Inexperienced Person Can Use It.
- Five Pounds will Cover with a Good Body 500 Square Feet, on a Hard-Finished Wall.

Ask for "JOHNSTON'S DRY SIZED KALSOMINE,"

and see that you do not get any poor substitute. For sale by Paint, Drug and Hardware Dealers everywhere.

Dry Kalsomine and Fresco Paint Works,

Nos. 25 and 27 JOHN STREET, BROOKLYN, N. Y.

1889. OVER 1000 TONS 1889.

OF IT

USED WITH SAFETY TO MAN AND BEAST.

ITS EFFICACY

IS CONCEDED

BY ALL

Who Make Thorough Tests.

NEEDED IN ALL THE VILLAGES OF AMERICA.

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B. HAMMOND,

Sold by Seedsmen, Wholesale and Retail.

FISHKILL-ON-HUDSON, N. Y.

Common Names of Chemical Substances.

Common Names.	Chemical Names.
Aqua Fortis	Nitric Acid.
Aqua Regia	Nitro-Muriatic Acid.
Blue Vitriol	Sulphate of Copper.
Cream of Tartar	Bitartrate Potassium.
Calomel	Chloride of Mercury.
Chalk	Carbonate Calcium.
Salt of Tartar	Carbonate of Potassa.
Caustic Potassa	Hydrate Potassium.
Chloroform	Chloride of Gormyle.
Common Salt	Chloride of Sodium.
Copperas, or Green Vitriol	Sulphate of Iron.
Corrosive Sublimate	Bi-Chloride of Mercury.
Diamond	Pure Carbon.
Dry Alum	Sulphate Alluminum and Potassium.
Epsom Salts	Sulphate of Magnesia.
Ethiops Mineral	Black Sulphide of Mercury.
Fire Damp	Light Carburetted Hydrogen.
Galena	Sulphide of Lead.
Glauber's Salt	Sulphate of Sodium.
Glucose	Grape Sugar.
Goulard Water	Basic Acetate of Lead.
Iron Pyrites	Bi-Sulphide of Iron.
Jeweler's Putty	Oxide of Tin.
King's Yellow	Sulphide of Arsenic.
Laughing Gas	Protoxide of Nitrogen.
Lime	Oxide of Calcium.
Lunar Caustic	Nitrate of Silver.
Mosaic Gold	Bi-Sulphide of Tin.
Muriate of Lime	Chloride of Calcium.
Nitre of Saltpetre	Nitrate of Potash.
Oil of Vitriol	Sulphuric Acid.
Potash	Oxide of Potassium.
Realgar	Sulphide of Arsenic.
Red Lead	Oxide of Lead.
Rust of Iron	Oxide of Iron.
Salmoniac	Muriate of Ammonia.
Slacked Lime	Hydrate Calcium.
Soda	Oxide of Sodium.
Spirits of Hartshorn	Ammonia.
Spirit of Salt	Hydro-Chloric or Muriatic Acid.
Stucco, or Plaster of Paris	Sulphate of Lime.
Sugar of Lead	Acetate of Lead.
Verdigris	Basic Acetate of Copper.
Vermillion	Sulphide of Mercury.
Vinegar	Acetic Acid (Diluted).
Volatile Alkali	Ammonia.
Water	Oxide of Hydrogen
White Precipitate	Ammoniated Mercury.
White Vitriol	Sulphate of Zinc.

To Obtain the Weight of Grindstones.

Rule: Square the diameter (in inches), multiply by thickness (in inches), then multiply by decimal .06363.

Example: Find the weight of a stone 4 feet 6 inches diameter and 7 inches thick.

4 ft. 6 in.=54 inch; square of 54=2916; multiplied by 7=20412; multiplied by .06363=Ans., 1298.815 lbs., which is weight of stone. All Grindstones weighing *less* than 200 lbs. are sold at "cut-weight." This is the actual weight over the scales as they come from the lathe (less a fair amount for moisture), and is cut into each stone. All Grindstones weighing *over* 200 pounds are sold by measurement-weight only, rule for which is given.

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GRAND RAPIDS, MICH.

Eastern Branch and Export Office:
103 CHAMBERS ST.,
NEW YORK.

"Bissell's Grand Rapids."

THE MOST POPULAR CARPET SWEEPER OF THE TIMES.

BISSELL CARPET SWEEPER CO.

Carpet Sweepers Only.

We aim to meet every demand as to Style and Price, and Cater for the Trade of the World. The Celebrated Bissell Broom-Movement is embodied in one of our most valuable patents, and is used in all of our 4-Wheeled-Sweepers. No Carpet Sweeper is perfect without this feature, which enables the Sweeper to be gauged to light or heavy sweeping by a natural pressure on the handle. No manipulation of a Sweeper-ball up and down can produce satisfactory results.

Every Sweeper Guaranteed. Mechanical Construction and finish perfect.

Send for Price-Lists and Descriptive Circulars.

METRIC SYSTEM OF WEIGHTS AND MEASURES.

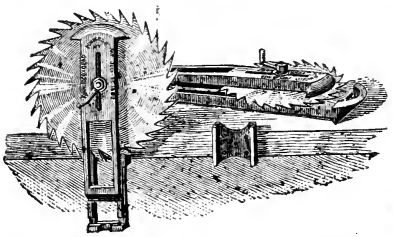
The metric system is based upon the distance from the equator to the pole. The ten-millionth part of this arc was chosen as the unit of measure of length, and called a *Metre*. The cube of the tenth part of the metre was adopted as the unit of capacity, and denominated a *Litre*. The weight of a litre of distilled water at its greatest density was cal'ed a *Kilogramme*, of which the thousandth part, or *Gramme*, was adopted as the unit of weight. The multiples of these, proceeding in decimal progression, are distinguished by the employment of the prefixes *deca*, *hecto*, *kilo* and *myria*, from the Greek, and the subdivisions by *deci*, *centi* and *milli*, from the Latin:

TABLE FOR THE CONVERSION OF METRIC WEIGHTS AND MEASURES INTO ENGLISH.

Metres into Yards.		Kilometres to Miles and Yards.			Litres into Gallons and Quarts.			Hectolitres into Quarts and Bushels.			Kilogrammes into Cwts. Qrs. Lbs. Oz.				Hectares into acres. r. p.		
1	1·094	1	0	1094	1	0	0·880	1	0	2·751	1	0	0	2 3¾	1	2	1 35
2	2·187	2	1	427	2	0	1·761	2	0	5·502	2	0	0	4 6½	2	4	3 31
3	3·281	3	1	1521	3	0	2·641	3	1	0·254	3	0	0	6 9¾	3	7	1 26
4	4·374	4	2	855	4	0	3·521	4	1	3·005	4	0	0	8 13	4	9	3 22
5	5·468	5	3	188	5	1	0·402	5	1	5·756	5	0	0	11 0¾	5	12	1 17
6	6·562	6	3	1282	6	1	1·282	6	2	0·507	6	0	0	13 3⅜	6	14	3 12
7	7·655	7	4	615	7	1	2·163	7	2	3·258	7	0	0	15 7	7	17	1 8
8	8·749	8	4	1709	8	1	3·043	8	2	6·010	8	0	0	17 10¾	8	19	3 3
9	9·843	9	5	1043	9	1	3·923	9	3	0·761	9	0	0	19 13½	9	22	0 38
10	10·936	10	6	376	10	2	0·804	10	3	3·512	10	0	0	22 0¾	10	24	2 34
20	21·873	20	12	753	20	4	1·608	20	6	7·024	20	0	1	16 1¾	20	49	1 28
30	32·809	30	18	1129	30	6	2·412	30	10	2·536	30	0	2	10 2½	30	74	0 21
40	43·745	40	24	1805	40	8	3·215	40	13	6·048	40	0	3	4 3	40	98	3 15
50	54·682	50	31	122	50	11	0·019	50	17	1·560	50	0	3	26 3¾	50	123	2 9
60	65·618	60	37	498	60	13	0·823	60	20	5·072	60	1	0	20 4½	60	148	1 3
70	76·554	70	43	874	70	15	1.627	70	24	0·585	70	1	1	14 5¼	70	172	3 37
80	87·491	80	49	1251	80	17	2·431	80	27	4·097	80	1	2	8 6	80	197	2 38
90	98·427	90	55	1627	90	19	3·235	90	30	7·609	90	1	3	2 6½	90	222	1 24
100	109·363	100	62	243	100	22	0·039	100	34	3·121	100	1	3	24 7	100	247	0 18
200	218·727	200	124	487	200	44	0·077	200	68	6.242	200	3	3	20 15	200	494	0 37
300	328·090	300	186	730	300	66	0·116	300	103	1·362	300	5	3	17 6	300	741	1 15
400	437·453	400	248	973	400	88	0·155	400	137	4·483	400	7	3	13 14	400	988	1 33
500	546·816	500	310	1217	500	110	0·193	500	171	7·604	500	9	3	10 5	500	1235	2 11

COXHEAD'S

Combined Saw Vise and Set.



PATENTED
July 5, 1882,
and
March 8, 1887.

Made in 3 Sizes for Circular Saws.

Holding Saws from 5 to 10, 7 to 18, and 8 to 26 inches in diameter. Also in TWO SIZES FOR HAND, BAND AND SCROLL SAWS.

THESE VISES ARE ALSO MADE WITHOUT THE SETS.

A SAMPLE TESTIMONIAL:

WASHINGTON, D. C., March 16, 1887.

James B. Lambie—Dear Sir: The number 2 and 4, Coxhead Patent Saw Set and Vise Combined, bought of you about one year ago, have given entire satisfaction. I would not be without them.

Yours Respectfully, CHARLES C. BORLAND,
Master Carpenter at Bureau of Engraving and Printing,
Washington, D. C.

Send for Catalogue and Trade Discount.

Manufactured by JOHN F. COXHEAD, Poughkeepsie, N.Y.

The object of this Diamond Point can be readily seen, in that it prevents the Set from slipping from the head of the nail while in use, thus saving in many cases some valuable piece of work.

It is fast taking the place of every other Nail Set.
Once seen, Mechanics will have no other.

These Sets are Carefully made from the best quality of Tool Steel. The Points are turned and thoroughly tempered, and will not break off.

EACH SET FULLY WARRANTED.

The Trade Supplied. Put up in boxes of One dozen, 1-4 gross and One gross, Assorted sizes. Prices and terms upon application.

MANUFACTURED ONLY BY

The Edward Storm Spring Co., Limited.

POUGHKEEPSIE, N. Y.

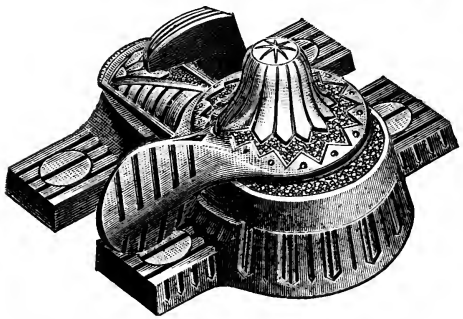
SPECIFIC GRAVITY AND WEIGHTS OF VARIOUS SUBSTANCES.

NAMES OF SUBSTANCES.	Average Weights. Per Cubic Ft.	Per Sq. Ft. 1 in. thick	Specific Gravity.
Anthracite, solid, of Pa	93		1.50
" broken, loose	54		
" " shaken	58		
" heaped bushel, loose.	(80 per	bushel,	heaped.)
Asphaltum	87	7.25	1.40
Brass, cast	504	42.	8.09
" rolled	524	43.7	8.4
Brick, best pressed	150		2.4
" common hard	125		2
" soft	100		1.6
Brickwork, pressed brick	140		2.25
" ordinary	112		1.8
Cement, Rosendale (loose)	56		
" Louisville "	50		
" Portland "	90		1.3
Coal, bituminous, solid	84		1.35
" " broken, loose	49		
" " " "	(74 per	bushel,	heaped.)
Coke, loose	27		
" heaped bushel, 38 lbs			
Copper, cast	542	45.2	8.7
" rolled	548	45.7	8.8
Earth, common dry, loose	76		
" " rammed	95		
" soft mud	108		
Glass	157	13.	2.53
Gneiss	168		2.7
Gold, cast, 24 karat	1204		19.3
" hammered, 24 karat	1217		19.6
Granite	170		2.73
Ice	58.7		0.95
Iron, cast	450	37.5	7.24
" wrought (hammered)	485	40.6	7.8
" " (rolled)	480	40.	7.7

NAMES OF SUBSTANCES.	Average Weights. Per Cubic Ft.	Per Sq. Ft. 1 in. thick	Specific Gravity.
Lead	711	59.25	11.4
Lime, loose quicklime	53		
" per bushel, 66 lbs			
Limestone and marble	168		2.7
Masonry, granite or limestone	165		
" rubble	154		
" dry	138		
" sandstone	144		
Mercury, at 32° F	849		13.6
Mortar, hardened	103	8.6	1.66
Mud, dry	80–110		
Petroleum	55		0.88
Quartz	165		2.65
Salt, Syracuse, coarse	45		
" fine Liverpool	49		
Sand, pure, dry, loose	90–106		
" shaken	99–117		
" perfectly wet	120–140		
Sandstone	151		2.43
Shales, red or black	162		2.6
Silver	655		10.5
Slate	175	14.6	2.8
Snow, fresh	5– 12		
" slush	15– 20		
Steel	490	$40\frac{5}{6}$	7.9
Sulphur	125		2.0
Tar	62		1.0
Tin	459		7.4
Turf or Peat, dry	20– 30		
Water, pure, at 60° F	$62\frac{1}{4}$		1.00
" sea	64		1.028
Zinc or Spelter, cast	446	37.1	7.15
" " rolled	448	37.3	7.19

IVES' PATENT SASH LOCKS.

Warranted Burglar Proof.



A very important feature of the IVES' SASH LOCK is in its securely locking when closed, and simultaneously drawing the meeting rails closely together. All the movements are accomplished by cams without the instrumentality of springs, thus avoiding the possibility of getting out of order.

Ives' Patent Sash Locks

—AND—

DOOR BOLTS.

For sale by all Dealers in Hardware.

Patented April 17, 1883; Oct. 16, '83; Dec. 30, '84; March 24, '85; May 12, '85; June 23, '85; Patented in Canada March 24, 1886.

HOBART B. IVES & CO.,

SOLE MANUFACTURERS AND PATENTEES,

Send for Illustrated Price-Lists. **NEW HAVEN, CONN.**

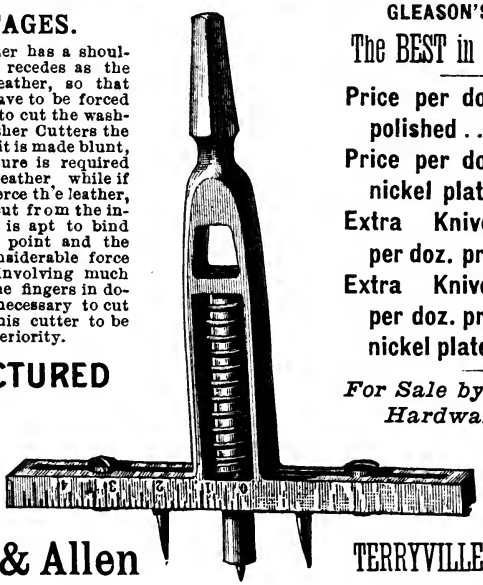
THE ◆ EAGLE ◆ WASHER ◆ CUTTER.

ADVANTAGES.

This Washer Cutter has a shouldered point, which recedes as the knives enter the leather, so that the point does not have to be forced through the leather to cut the washer. In all other Washer Cutters the point is fixed, and if it is made blunt, a great deal of pressure is required to force it into the leather, while if it is made slim to pierce the leather, the disk of leather cut from the inside of the washer is apt to bind between the center point and the knife, requiring considerable force to remove it, and involving much danger of cutting the fingers in doing so. It is only necessary to cut one washer with this cutter to be convinced of its superiority.

MANUFACTURED

ONLY BY



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The BEST in the World.

Price per doz., polished	**$12.00**
Price per doz., nickel plated	**18.00**
Extra Knives, per doz. pr's.	**2.00**
Extra Knives, per doz. pr's. nickel plated.	**3.00**

For Sale by the Hardware Trade.

Gleason & Allen TERRYVILLE, CONN.

ELECTRICAL CONDUCTIVITY OF METALS.

The most reliable tests of electric conductivity of the metals are those lately made by Mr. L. Weiller. They were conducted with a series of bars specially prepared for the purpose. The measurements were taken by means of a Wheatstone bridge with a sliding index, a differential galvanometer, and a battery of four cells. The results are given in the following table, the comparison being based on the conductivity of silver, which is taken as 100:

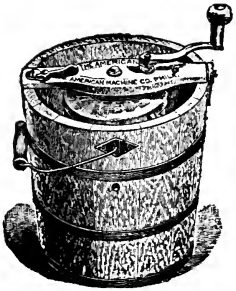
Names of Metals.	Conductivity.
Silver, pure	100
Copper, pure	100
Copper, pure, super-refined and crystallized	99.9
Silicon bronze, telegraphic	98
Copper and silver alloy at 50 per cent	86.65
Gold, pure	78
Silicon copper, 4 per cent. of silicon	75
Silicon copper, 12 per cent. of silicon	54.7
Aluminium, pure	54.2
Tin, with 10 per cent. of sodium	46.9
Silicon bronze, telephonic	35
Plumbiferous copper, with 10 per cent. of lead	30
Zinc, pure	29.9
Phosphor-bronze	29
Silicon brass, with 25 per cent. of zinc	26.49
Brass, with 35 per cent. of zinc	21.15
Phosphor-tin	17.7
Gold and silver, 50 per cent. each	16.12
Swedish iron	16
Banca tin, pure	15.45
Antimonous copper	12.7
Aluminium bronze, 10 per cent. Al	12.6
Cadmium Amalgam, 15 per cent. Cd	12.2
Siemens steel	12
Mercurial bronze	10.14
Platinum, pure	10.6
Arsenical copper, 10 per cent. arsenic	9.1
Lead, pure	8.88
Bronze, with 20 per cent. of tin	8.4
Nickel, pure	7.89
Phosphor-bronze, 10 per cent. tin	6.5
Phosphor-copper, 9 per cent. phosphorus	4.9
Antimony	3.88

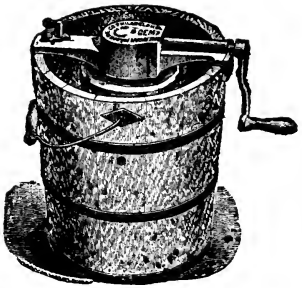
Relative Non-Conductivity of Materials.

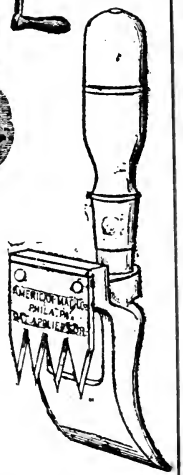
Mr. Charles E. Emery of New York recently made some experiments upon relative non-conductivity, with reference to the needs of the New York Steam Company. His apparatus consisted of a boiler 12 feet in diameter, with three 10-inch flues passing through it. Inside these flues were smaller tubes, through which the steam passed. The non-conductors surrounded the inner tubes, and water was kept circulating around the flues in the outer shell. A layer of hair felt 2 inches thick gave the best result, and using equal thicknesses of the other materials the following percentage was obtained:

Hair felt	100	Loam	55
Mineral wool, No. 2	83.2	Gas-works lime, slaked	48
Mineral wool, No. 2 and tar	71.5	Asbestos	36.3
Sawdust	68	Coal ashes	34.5
Mineral wool, No. 1	67.6	Fuel coke	27.7
Charcoal	63.2	Air space, 2 inches deep	13.6
Pine wood, across grain	55.3		

The low result from air-space no doubt is due to the unimpeded circulation of the current.







"AMERICAN" SINGLE-ACTION

"GEM" DOUBLE-ACTION

ICE CREAM FREEZERS.

THE BEST IN THE WORLD.

Manufactured by

AMERICAN MACHINE COMPANY,

N. E. Cor. Lehigh Avenue and American St., PHILADELPHIA.

Star Ice Chipper.

Send for Catalogue and "Some Reasons Why" the "Gem" is the Best Freezer in the World.

Crown Ice Chipper

SHELF BOXES

JESSE JONES & CO.

No. 615 COMMERCE ST.

PHILADELPHIA

HARDWARE

MADE OF WOOD WITHOUT NAILS OR SCREWS.

SEND FOR CATALOGUE.

PAPER BOXES ALL KINDS FOR HARDWARE.

UNBREAKABLE

SEND FOR CIRCULAR SHOWING WHAT PEOPLE THINK OF THEM, WHO ARE AND HAVE BEEN USING THEM FOR YEARS.

SOME THINGS THAT ARE MISNAMED.

The misapplication of a name in speaking of the common things of life is a source of many errors, especially in the young. The reason why things are not rightly named in all cases is not because of any deficiency of our language, but because the names of most common substances were given long years ago, and very often before the true nature of the articles were understood. The "Journal of Applied Science" has this to say upon the subject:

Why should trade not have a Johnson to classify and correct the mass of inconsistencies that go to make up its nomenclature? We not only tax our brains to invent "fantastic" names for every new fabric, varied, perhaps, only by a thread or a shade from what our grandparents wore a century ago, but there are in use positive misnomers for many staple articles of merchandise. The following imperfect list, culled from sources already at hand, will give a faint idea of them:

Acid (sour), applied in chemistry to a class of bodies to which sourness is only accidental, and by no means a universal characteristic Thus rock crystals, quartz, flint, etc., are chemical acids, though no particle of acidity belongs to them.

Black lead does not contain a single particle of lead, being composed of carbon and iron.

Brazilian grass does not come from Brazil, or even grow there; nor is it grass at all. It consists of a palm leaf (Thrinax argentea), and is imported chiefly from Cuba.

Burgundy pitch is not pitch, nor is it manufactured in or exported from Burgundy. The best is a resinous substance prepared from common frankincense, and brought from Hamburg; but by far the greater quantity is a mixture of rosin and palm oil.

China, as a name for porcelain, gives rise to the contradictory expressions—British china, Dutch china, Chelsea china, etc., like wooden milestones, iron milestones, brass shoe-horns, iron pens, steel pens.

Cuttle bone is not bone at all, but a structure of pure chalk, once embedded loosely in the substance of certain species of cuttle fish. It is enclosed in a membraneous sac within the body of the fish, and drops out when the sac is opened, but it has no connection whatever with the sac of the cuttle fish.

Galvanized iron is not galvanized. It is simply iron coated with zinc; and this is done by dipping it in a zinc bath containing muriatic acid.

German silver is not silver at all, nor was the metallic alloy called by that name invented by a German, but has been in use in China time out of mind.

Honey soap contains no honey, nor is honey in any way employed in its manufacture. It is a mixture of palm oil, soap and olive-oil soap, each one part, with three parts of curd soap, or yellow soap scented.

Japan lacquer contains no lac at all, but is made from the sap of a tree called Rhus vernicifera.

Kid gloves are not usually made from kid skins, but of lamb or sheep skins. At present many of them are made of rat skins.

Meerschaum is not petrified "sea foam," as its name implies, but is a composition of silica, magnesia and water.

Mosaic gold has no connection with Moses or the metal gold. It is an alloy of copper and zinc, used in the ancient museum or tessellated work.

Mother-of-pearl is the inner layer of several sorts of shells. It is not the mother of pearl, as its name indicates, but in some cases the matrix of the pearl.

Pen means a feather (Latin penna, a wing). A steel pen is not a very choice expression.

Prussia blue does not come from Prussia, but is the precipitate of the salt of protoxide of iron with prussiate of potassa.

Salad oil is not oil for salad, but oil for cleaning sallades—i. e., helmets.

Salt is not salt at all, and has long been excluded from the class of bodies denominated "salts."

Sealing wax is not wax at all, nor does it contain a single particle of wax. It is made of shellac, Venice turpentine and cinnibar. Cinnibar gives it a deep, red color, and the turpentine renders the shellac soft and less brittle.

Sperm oil properly means "seed oil" (Latin, sperma, seed), from the notion that it was spermaceti (the sperm or melt of a whale). The sperm whale is the whale that gives "seed oil," which is taken chiefly, but not wholly from the head.

Whalebone is not bone at all, nor does it possess any of the properties of bone. It is a substance attached to the upper jaw of the whale, and serves to strain the water which the creature takes up in large mouthfuls.

Rhinoceros horn is not horn at all, but a kind of matted or compact hair, and is only like a horn from being a protuberance on the animal's head.

RANSOM & CO.,

WROUGHT AND CAST IRON PIPE AND FITTINGS,

Brass and Iron Valves and Cocks,

RAILWAY, STEAMSHIP, ENGINEERS' AND FACTORY SUPPLIES,

94 & 96 CENTRE STREET,

Telephone "Murray 630." **NEW YORK.**

SELLING AGENTS FOR

PIERCE STEAM HEATING CO.—"Excelsior," "Ideal" and "Peerless" Radiators.

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THE New York Safety **Dumb-Waiter**

—AND—

HUMPHREY PONY Hand Elevator.

Cheapest and Best.

Any carpenter or builder can put them in.

Sold by all Hardware Stores.

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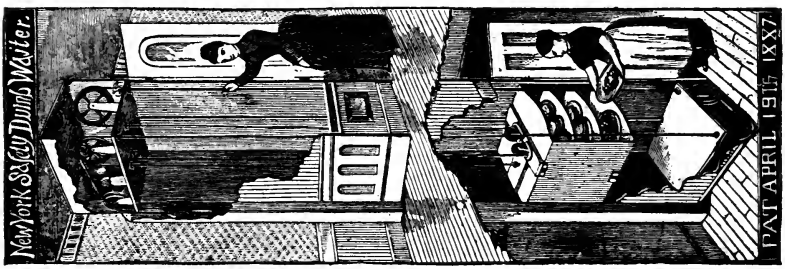
EDWARD **Storm Spring Co** (LIMITED,)

Poughkeepsie, N.Y.



Length and Number of Cut Nails to the Pound.

SIZE.	Length.	Common.	Clinch.	Fence.	Finishing.	Fine.	Barrel.	Casing.	Brads.	Tobacco.	Cut Spikes.
¾.....	¾ in	.....	....	....	.....	.....	800	.....	.....	.....	....
⅞.....	⅞	.....	....	....	.....	.....	500	.....	.....	.....	....
2d.....	1	800	.. ..	....	1100	1000	376	....	.....	.....	....
3d.....	1¼	480	....	....	720	760	224	.....	.....	.....	....
4d.....	1½	288	....	....	523	368	180	398	.....	.....	....
5d.....	1¾	200	....	....	410	.....	.....	.....	.....	180	....
6d.....	2	168	95	84	268	.....	.....	224	126	96	....
7d.....	2⅛	124	74	64	184	.....	.....	.....	98	82	...
8d.....	2¼	88	62	48	146	.....	.....	128	75	68	....
9d.....	2¾	70	53	36	130	.....	.....	110	65	.....	....
10d.....	3	58	46	30	102	.....	.....	91	55	.....	28
12d.....	3¼	44	42	24	76	.....	.....	71	40	.....	....
16d.....	3½	34	38	20	62	.....	.....	54	27	.....	21
20d.....	4	23	33	16	54	.....	.....	40	.....	.....	14½
30d.....	4½	18	20	....	.....	.....	.....	33	.....	.....	12½
40d.....	5	14	....	.....	.....	.....	.....	27	.....	.....	9½
50d.....	5½	10	....	.....	.....	.....	.....	.....	.....	.....	8
60d.....	6	8	....	.....	.....	.....	.....	.....	.....	.....	6
.....	6½	.....	....	.....	.....	.....	.....	.....	.....	.....	5½
.....	7	.....	....	.....	.....	.....	.....	.....	.....	.....	4½
.....	8	.....	....	.....	.....	.....	.....	.....	.....	.....	2½

NUMBER OF TACKS IN A POUND.

Title.	Length.	No. per lb.	Title.	Length.	No. per lb.
1 ounce.	$\frac{3}{16}$ inch.	16,000	10 ounce.	$\frac{13}{16}$ inch.	1,600
1½ ounce.	$\frac{7}{32}$ inch.	10,666	12 ounce.	$\frac{11}{16}$ inch.	1,332
2 ounce.	$\frac{1}{4}$ inch.	8,000	14 ounce.	$\frac{13}{16}$ inch.	1,143
2½ ounce.	$\frac{5}{32}$ inch.	6,400	16 ounce	$\frac{15}{16}$ inch.	1,000
3 ounce.	$\frac{3}{16}$ inch.	5,332	18 ounce.	$\frac{17}{16}$ inch.	888
4 ounce.	$\frac{7}{16}$ inch.	4,000	20 ounce.	$\frac{15}{16}$ inch.	800
6 ounce.	$\frac{5}{16}$ inch.	2,666	22 ounce.	1 inch.	727
8 ounce.	$\frac{9}{16}$ inch.	2,000	24 ounce.	1⅛ inch.	666

STANDARD WIRE BRAD LIST.

Length.	Gauge.			Length.	Gauge.		
Inch.	Fine.	Med.	Stout.	Inch.	Fine.	Med.	Stout.
⅜	21	20	19	1½	16	15	14
½	20	19	18	1¾	15	14	13
⅝	20	19	18	2	14	13	12
¾	19	18	17	2½	14	13	12
⅞	18	17	16	2½	13	12	11
1	18	17	16	2¾	13	12	11
1¼	17	16	15	3	12	11	10

The Term "Penny" as Applied to Nails.

The origin of the terms "six-penny," "ten-penny," etc., as applied to nails, though not commonly known, is involved in no mystery whatever. Nails have been made a certain number of pounds to the thousand for many years, and are still reckoned in that way in England, a ten-penny being a thousand nails to ten pounds, a six-penny a thousand to six pounds, a twenty-penny weighing twenty pounds to the thousand; and, in ordering, buyers call for the three-pound, six-pound, or ten-pound variety, etc., until, by the Englishmen's abbreviation of "pun" for "pound," the abbreviation has been made to stand for penny, instead of pound, as originally intended.

Rules to be Observed in Ordering Metal or Wire.

In case parties ordering Metal or Wire have no Gauge, a smallpiece of either material may be sent, which will answer for the Number.

All Copper in sheets is numbered according to Stubs' Gauge.

All Brass in Sheets is numbered according to Brown & Sharpe's Gauge.

Brass and Copper Wire is numbered according to Stubs' Gauge.

Brazed Brass and Copper Tubing is numbered according to Brown & Sharpe's Gauge.

Seamless Brass and Copper Tubing is numbered according to Stubs' Gauge.

All orders, when the name of Gauge is not stated, will be filled as above.

In ordering Metal always state width and temper wanted.

In ordering Wire always state whether Hard, Soft or Spring Wire is wanted.

The term "High" Brass refers to color, and not to temper.

For table of information relating to Weights and Sizes of Sheet Copper, see Contents.

For table showing the difference between Gauges, see Contents.

Copper Rivets and Burs.

Copper Rivets and Burs are packed as follows:

Belt Rivets and Burs, an equal number of each in 1-lb. boxes.

Belt Rivets only, in 1-lb. boxes.

Belt and Hose Rivets only, no Burs, in 4-lb. boxes.

Oval-Head Trunk Rivets only, no Burs, No. 9, in 4-lb. boxes.

Braziers' Rivets only, in 5-lb. boxes.

Burs only, in 1-lb. boxes.

Belt Rivets, assorted lengths, from ¾-inch to ¾-inch, of one number, with Burs to match, in ½-lb. and 1-lb. boxes.

Sizes of Soldering Coppers.

Pointed, 1½ lbs. per pair.
" 2, 3, 4, 5, 6, 7, 8, 9, 10, 12 lbs. per pair.
Flat, 3, 4, 5, 6, 7, 8 lbs. per pair.
Hatchet, 4, 5, 6, 7, 8, 9, 10 lbs. per pair.
Roofing, 11 lbs. per pair, with handles and shield.

Weights of Roof Coverings Per Square of 100 Square Feet.

	Weight.	Last Slope.
Slating	550 to 650 lbs.	26 to 30 deg.
Lead, 6½ to 7 lbs. to square ft	650 to 700 lbs.	4 degrees.
Corrugated iron	300 pounds.	6 degrees.
Copper or zinc, 16 oz. per sq. ft	100 pounds.	4 degrees.
Tin, 20x28, flat seam	66 pounds.	3 degrees.
Tin, 20x28, standing seam	69 pounds.	8 degrees.
Tin, 14x20, standing seam	74 pounds.	8 degrees.
Tin, 14x20, flat seam	68 pounds.	3 degrees.
Boarding, ¾ thick	250 pounds.	
Boarding, 1½ thick	500 pounds.	

CUT SPIKES.

NUMBER IN KEG OF 100 POUNDS.

3 inch	2900	5 inch	950	6½ inch	575
3½ "	2100	5½ "	850	7 "	450
4 "	1500	6 "	775	8 "	375
4½ "	1150				

RAILROAD SPIKES.

NUMBER IN 100 POUNDS.

Thickness.	Length.									
	3	4	5	6	7	8	9	10	12	14
¼	1340	1060	870	680						
5/16		620	580	540						
11/32			460	380	320	290	250			
7/16			320	280	240	220	200			
½			260	210	180	170	140	130	110	
9/16			170	130			100	90	80	70

WROUGHT BOAT AND SHIP SPIKES.

NUMBER IN A KEG OF 150 POUNDS.

Thickness.	Length.												
	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	10
¼	1910	1585	1326	1223	1025									
5/16	1010	963	810	605	583		521							
7/16			542	503	461	423	402	321						
½					340	312	298	280	261	240	223			
9/16							221	200	190	180	170	160	150	130
⅝											140	130	120	100

WEIGHT AND THICKNESS OF BOILER IRON.

1/8	inch weighs	5	lbs. per sq. ft.	No. 1	Iron is	5/16	inch thick.
3/16	"	7½	" "	No. 3	"	9/32	"
¼	"	10	" "	No. 4	"	¼	"
5/16	"	12½	" "	No. 5	"	7/32	"
⅜	"	15	" "	No. 7	"	3/16	"
7/16	"	17½	" "				
½	"	20	" "				

TABLE

SHOWING AVERAGE WEIGHT PER FATHOM, ADMIRALTY TEST, AND SIZES OF CHAINS REQUIRED FOR VESSELS, ACCORDING TO THEIR REGISTERED TONNAGE. FOR LOW DECK VESSELS ADD ONE FIFTH TO THE TONNAGE.

Size.	Common Coil Weight in 100 feet.	Proved. Av'g Weight per Fathom.		Size of Rope.	Proof.		Ship's Tonnage.	Size of Anchor.
Inches.		Stud.	Short Link.	Inches.	Cable Chain.	B B B Crane Chain.		
3-16	50	.....	4	1	.....	.....	.....	.....
¼	80	.....	6	1¾	1	1⅛	.....	.....
5-16	100	.....	7	2⅛	1⅛	2	.....	.....
⅜	140	.....	9	3¼	2	3	.....	.....
7-16	210	.....	12	4	3	4	.....	.....
½	265	.....	15	4¾	4	5	30	150
9-16	320	.....	19	5⅛	5	6	50	200
⅝	420	.....	25	6¼	6	8	75	300
11-16	500	.....	30	7	8	10	100	400
¾	590	33	35	7¾	10	12	100	500
13-16	680	38	40	8⅛	12	14	110	600
⅞	790	43	46	9¼	14	16	130	700
15-16	.....	50	54	10	16	18	160	800
1	.....	58	61	10¾	18	22	200	900
1 1-16	.....	65	69	11¼	20	26	240	1,100
1⅛	.....	72	76	12	23	28	280	1,300
1 3-16	.....	80	85	12¾	26	30	320	1,450
1¼	.....	89	95	13⅛	28	34	360	1,600
1 5-16	.....	98	104	14¼	30	37	400	1,750
1⅜	.....	110	115	15	34	41	440	1,900
1 7-16	.....	118	125	15⅝	37	44	500	2,100
1½	.....	128	135	16	41	48	550	2,300
1 9-16	.....	138	148	16⅝	44	52	600	2,500
1⅝	.....	150	160	17¼	48	66	700	2,700
1 11-16	.....	161	.....	18	52	.....	850	2,900
1¾	.....	175	.....	18¾	56	.....	1,000	3,100
1 13-16	.....	188	.....	19¼	60	.....	1,150	3,300
1⅞	.....	200	.....	20	64	.....	1,300	3,500
1 15-16	.....	215	.....	21	68	.....	1,450	3,700
2	.....	230	.....	22	72	.....	1,600	3,900
2⅛	.....	250	.....	.....	80	.....	2,000	4,300
2¼	.....	290	.....	.....	88	.....	2,500	4,700

⅜ inch and smaller chains are made of full size iron; all other sizes exact. Tested to the English Admiralty Standard.

German Coil Chain.

Wire Gauge	5	6	7	8	9	10	11	12	13
Number	000	00	0	1	2	3	4	5	6
Weight in lbs. of 100 feet	37	30¼	24	19	14¾	11¼	8¾	7	4¼
Breaking Strength	695	580	520	488	360	322			

TRAVERS BROTHERS,

107 DUANE ST., and 16 THOMAS ST..

NEW YORK,

MANUFACTURERS AND SOLE AGENTS FOR

PEERLESS SASH CORDS AND TWINES.

BRAIDED EDGE

Mexican Hammocks.

Peerless Hammock Spreaders.

ANCHOR HAMMOCK ROPES.

Liberty Mills Twines and Cords.

HARMONY MILLS TWINES AND CORDS.

PEERLESS SEA ISLAND TWINES.

Gem Sea Island and Cotton Twines.

PEERLESS HAMMOCK HOOKS.

AGENTS FOR

THE SILVER LAKE COMPANY'S

SOLID BRAIDED

SASH CORDS AND LINES.

Office and Salesrooms:

107 Duane Street

—AND—

16 Thomas Street,

NEW YORK CITY.

APPROXIMATE WEIGHT and STRENGTH of CORDAGE.

Furnished by L. Waterbury & Co., New York City.

Circumference in inches.	Diameter in inches.	Weight of 100 fat'ms or 600 ft. in lbs.	Weight of 100 Fat'ms, Tarred in lbs.	Strength of New Ropes, in lbs.	No. of feet in 1 lb.
6 thd.	$\frac{3}{16}$ in.	12	17	540	50 feet,
9 "	$\frac{1}{4}$ "	18	24	780	33 " 4 in.
12 "	$\frac{5}{16}$ "	24	34	1000	25 "
15 "	$\frac{3}{8}$ "	30	45	1280	20 "
$1\frac{1}{4}$ in.	$\frac{7}{16}$ "	37	50	1562	17 " 8 in.
$1\frac{1}{2}$ "	$\frac{1}{2}$ "	46	55	2250	13 "
$1\frac{3}{4}$ "	$\frac{9}{16}$ "	65	85	3062	9 " 3 in.
2 "	$\frac{5}{8}$ "	80	100	4000	7 " 6 in.
$2\frac{1}{4}$ "	$\frac{11}{16}$ "	98	125	5000	6 "
$2\frac{1}{2}$ "	$\frac{3}{4}$ "	120	155	6250	5 "
$2\frac{3}{4}$ "	$\frac{13}{16}$ "	142	190	7500	4 " 3 in.
3 "	1 "	170	225	9000	3 " 6 in.
$3\frac{1}{4}$ "	$1\frac{1}{16}$ "	200	265	10500	3 "
$3\frac{1}{2}$ "	$1\frac{1}{8}$ "	230	300	12250	2 " 7 in.
$3\frac{3}{4}$ "	$1\frac{1}{4}$ "	271	350	14000	2 " 3 in.
4 "	$1\frac{5}{16}$ "	310	405	16000	1 " 11 in.
$4\frac{1}{4}$ "	$1\frac{3}{8}$ "	346	455	18062	1 " 8 in.
$4\frac{1}{2}$ "	$1\frac{7}{16}$ "	390	510	20250	1 " 6 in.
$4\frac{3}{4}$ "	$1\frac{9}{16}$ "	435	575	22500	1 " 5 in.
5 "	$1\frac{5}{8}$ "	480	640	25000	1 " 3 in.
$5\frac{1}{2}$ "	$1\frac{3}{4}$ "	581	775	30250	1 "
6 "	2 "	678	930	36000	$10\frac{2}{3}$ in.
$6\frac{1}{2}$ "	$2\frac{1}{8}$ "	797	1075	42250	9 in.
7 "	$2\frac{1}{4}$ "	920	1245	49000	$7\frac{2}{3}$ in.
$7\frac{1}{2}$ "	$2\frac{3}{8}$ "	1106	1405	56250	$6\frac{1}{2}$ in.
8 "	$2\frac{5}{8}$ "	1265	1600	64000	$5\frac{1}{2}$ in.
$8\frac{1}{2}$ "	$2\frac{7}{8}$ "	1420	1780	72250	5 in.
9 "	3 "	1572	2030	81000	$4\frac{1}{2}$ in.
$9\frac{1}{2}$ "	$3\frac{1}{8}$ "	1760	2285	90250	4 in.
10 "	$3\frac{3}{8}$ "	1951	2550	100000	$3\frac{1}{2}$ in.

The relative strength of Manila to Sisal is about as 7 is to 5; or Manila is about 25 per cent. stronger than Sisal. Hawser-laid Rope will weigh one-sixth less.

Number of Railroad Spikes Used to One Mile of Track.

Size measured under head.	Average No. per keg of 200 lbs.	Ties 2 feet between centers, 4 spikes per tie makes per mile.	Rail used, weight per yard.
$5\frac{1}{2}$x$\frac{9}{16}$	375	5870 lbs=29½ kegs.	45 to 70
5 x$\frac{9}{16}$	400	5170 " =26 "	40 to 56
5 x$\frac{1}{2}$	450	4660 " =23½ "	35 to 40
$4\frac{1}{2}$x$\frac{1}{2}$	530	3960 " =20 "	28 to 35
4 x$\frac{1}{2}$	600	3520 " =17⅔ "	24 to 35
$4\frac{1}{2}$x$\frac{7}{16}$	680	3110 " =15½ "	20 to 30
4 x$\frac{7}{16}$	720	2910 " =14½ "	
$3\frac{1}{2}$x$\frac{7}{16}$	900	2350 " =11 "	16 to 25
4 x$\frac{3}{8}$	1000	2090 " =10½ "	
$3\frac{1}{2}$x$\frac{3}{8}$	1190	1780 " = 9 "	16 to 20
3 x$\frac{3}{8}$	1240	1710 " = 8½ "	
$2\frac{1}{2}$x$\frac{3}{8}$	1342	1575 " = 7⅞ "	12 to 16

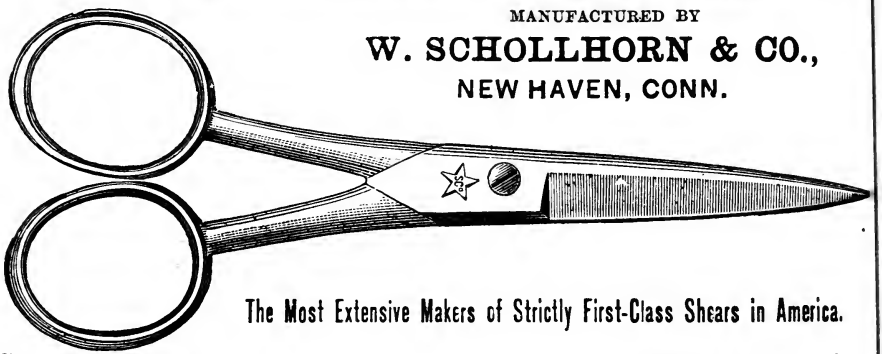
SEE PAGE 110.

The Star Scissors and Shears.

MANUFACTURED BY

W. SCHOLLHORN & CO.,

NEW HAVEN, CONN.

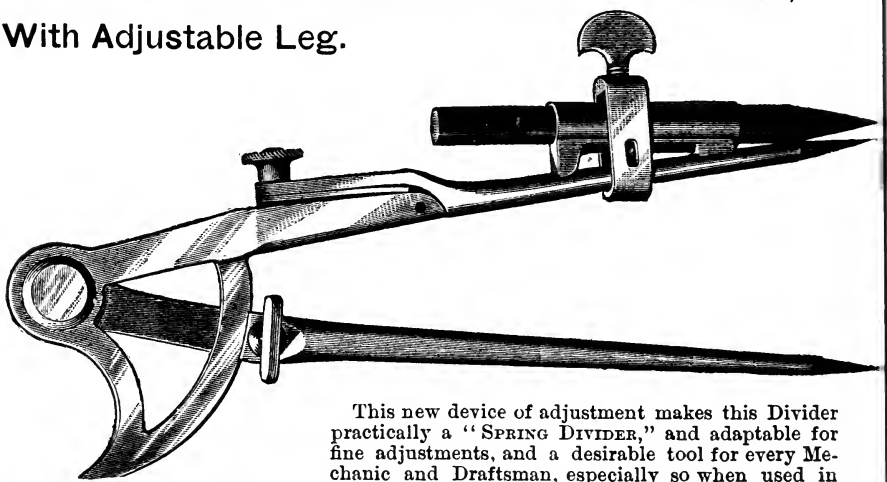


The Most Extensive Makers of Strictly First-Class Shears in America.

Complete Line of Ladies', Embroidery, Pocket, Buttonhole, Nail and Editors' Scissors; Tailors' Points, Straight and Bent Trimmers; Barbers', Bankers', Paper and Pruning Shears.

NEW MODEL EXCELSIOR SPRING DIVIDER,

With Adjustable Leg.



This new device of adjustment makes this Divider practically a "SPRING DIVIDER," and adaptable for fine adjustments, and a desirable tool for every Mechanic and Draftsman, especially so when used in connection with our well-known Excelsior Pencil Holder, as represented in cut. The segment fastening on this Divider is also known to the trade as superior to any other, and the points, which are the most essential feature on a tool of this kind, are made of STUBB'S STEEL WIRE, tempered and inserted two inches into each leg, which produces the best point, whether used on metal or wood.

Manufactured by

W. SCHOLLHORN & CO.,

NEW HAVEN, CONN.

FROM BROWN & SHARPE.

TABLE OF DECIMAL EQUIVALENTS.

of 8ths, 16ths, 32nds and 64ths of an Inch.

FOR USE IN CONNECTION WITH

MICROMETER CALIPER.

8ths.	32nds.	64ths.	64ths.
$\frac{1}{8}$=.125	$\frac{1}{32}$=.03125	$\frac{1}{64}$=.015625	$\frac{33}{64}$=.515625
$\frac{2}{8}$=.250	$\frac{3}{32}$=.09375	$\frac{3}{64}$=.046875	$\frac{35}{64}$=.546875
$\frac{3}{8}$=.375	$\frac{5}{32}$=.15625	$\frac{5}{64}$=.078125	$\frac{37}{64}$=.578125
$\frac{4}{8}$=.500	$\frac{7}{32}$=.21875	$\frac{7}{64}$=.109375	$\frac{39}{64}$=.609375
$\frac{5}{8}$=.625	$\frac{9}{32}$=.28125	$\frac{9}{64}$=.140625	$\frac{41}{64}$=.640625
$\frac{6}{8}$=.750	$\frac{11}{32}$=.34375	$\frac{11}{64}$=.171875	$\frac{43}{64}$=.671875
$\frac{7}{8}$=.875	$\frac{13}{32}$=.40625	$\frac{13}{64}$=.203125	$\frac{45}{64}$=.703125
16ths.	$\frac{15}{32}$=.46875	$\frac{15}{64}$=.234375	$\frac{47}{64}$=.734375
$\frac{1}{16}$=.0625	$\frac{17}{32}$=.53125	$\frac{17}{64}$=.265625	$\frac{49}{64}$=.765625
$\frac{3}{16}$=.1875	$\frac{19}{32}$=.59375	$\frac{19}{64}$=.296875	$\frac{51}{64}$=.796875
$\frac{5}{16}$=.3125	$\frac{21}{32}$=.65625	$\frac{21}{64}$=.328125	$\frac{53}{64}$=.828125
$\frac{7}{16}$=.4375	$\frac{23}{32}$=.71875	$\frac{23}{64}$=.359375	$\frac{55}{64}$=.859375
$\frac{9}{16}$=.5625	$\frac{25}{32}$=.78125	$\frac{25}{64}$=.390625	$\frac{57}{64}$=.890625
$\frac{11}{16}$=.6875	$\frac{27}{32}$=.84375	$\frac{27}{64}$=.421875	$\frac{59}{64}$=.921875
$\frac{13}{16}$=.8125	$\frac{29}{32}$=.90625	$\frac{29}{64}$=.453125	$\frac{61}{64}$=.953125
$\frac{15}{16}$=.9375	$\frac{31}{32}$=.96875	$\frac{31}{64}$=.484375	$\frac{63}{64}$=.984375

TABLE OF DECIMAL EQUIVALENTS

OF MILLIMETERS AND FRACTIONS OF MILLIMETERS,

FOR USE IN CONNECTION WITH

METRIC MICROMETER CALIPER.

mm.	Inches.	mm.	Inches.	mm.	Inches.	mm.	Inches.
$\frac{1}{100}$=	.00079	$\frac{20}{100}$=	.01575	$\frac{39}{100}$=	.03071	9=	.35433
$\frac{2}{100}$=	.00157	$\frac{21}{100}$=	.01654	$\frac{40}{100}$=	.03150	10=	.39370
$\frac{3}{100}$=	.00236	$\frac{22}{100}$=	.01732	$\frac{41}{100}$=	.03228	11=	.43307
$\frac{4}{100}$=	.00315	$\frac{23}{100}$=	.01811	$\frac{42}{100}$=	.03307	12=	.47244
$\frac{5}{100}$=	.00394	$\frac{24}{100}$=	.01890	$\frac{43}{100}$=	.03386	13=	.51181
$\frac{6}{100}$=	.00472	$\frac{25}{100}$=	.01969	$\frac{44}{100}$=	.03465	14=	.55118
$\frac{7}{100}$=	.00551	$\frac{26}{100}$=	.02047	$\frac{45}{100}$=	.03543	15=	.59055
$\frac{8}{100}$=	.00630	$\frac{27}{100}$=	.02126	$\frac{46}{100}$=	.03622	16=	.62992
$\frac{9}{100}$=	.00709	$\frac{28}{100}$=	.02205	$\frac{47}{100}$=	.03701	17=	.66929
$\frac{10}{100}$=	.00787	$\frac{29}{100}$=	.02283	$\frac{48}{100}$=	.03780	18=	.70866
$\frac{11}{100}$=	.00866	$\frac{30}{100}$=	.02362	$\frac{49}{100}$=	.03858	19=	.74803
$\frac{12}{100}$=	.00945	$\frac{31}{100}$=	.02441	.1=	.03937	20=	.78740
$\frac{13}{100}$=	.01024	$\frac{32}{100}$=	.02520	2=	.07874	21=	.82677
$\frac{14}{100}$=	.01102	$\frac{33}{100}$=	.02598	3=	.11811	22=	.86614
$\frac{15}{100}$=	.01181	$\frac{34}{100}$=	.02677	4=	.15748	23=	.90551
$\frac{16}{100}$=	.01260	$\frac{35}{100}$=	.02756	5=	.19685	24=	.94488
$\frac{17}{100}$=	.01339	$\frac{36}{100}$=	.02835	6=	.23622	25=	.98425
$\frac{18}{100}$=	.01417	$\frac{37}{100}$=	.02913	7=	.27559	26=	1.02362
$\frac{19}{100}$=	.01496	$\frac{38}{100}$=	.02992	8=	.31496		

10 mm. = 1 Centimeter = 0.3937 inches.
10 cm. = 1 Decimeter = 3.937 "
10 dm. = 1 Meter = 39.37 "
25.4 mm. = 1 English Inch.

OVAL SLIDE VISES.

SIZES OF SCREWS AND LENGTH OF JAWS.

Nos	00	0	1	2	3	4
Sizes of Screws...inches	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{8}$
Length of Jaws...inches	2	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4	$4\frac{1}{2}$
Weight, pounds	$7\frac{3}{4}$	11	18	29	$36\frac{1}{2}$	54

SOLID BOX VISES.

LENGTH OF JAWS TO EACH SIZE MANUFACTURED.

Nos	25	30	35	40	45	50	55	60	65
Length of Jaws...inches	$3\frac{3}{8}$	$3\frac{1}{2}$	$3\frac{7}{8}$	4	$4\frac{1}{4}$	$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{3}{4}$

SOLID BOX VISES.—(CONTINUED.)

Nos	70	75	80	85	90	95	100	105	110
Lg'th of Jaws, inches	5	5	$5\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{1}{2}$	$5\frac{3}{4}$	6	6	$6\frac{1}{4}$

SOLID BOX VISES.—(CONTINUED.)

Nos	115	120	125	130	135	140	145
Length of Jaws....inches	$6\frac{1}{4}$	$6\frac{1}{2}$	$6\frac{1}{2}$	$6\frac{3}{4}$	$6\frac{3}{4}$	7	7

SOLID BOX VISES.—(CONTINUED.)

Nos	150	160	170	180	190	200
Length of Jaws.....inches	7	$7\frac{1}{4}$	$7\frac{1}{4}$	8	8	8

BOXES AND SCREWS.

Diam. of Screw.								
$1\frac{1}{8}$ inch.	No.	1,	for	Vises	from	No.	30 to No.	50
$1\frac{1}{4}$ "	"	2,	"	"	"	"	55 to "	70
$1\frac{1}{4}$ "	"	3,	"	"	"	"	75 to "	85
$1\frac{1}{2}$ "	"	4,	"	"	"	"	90 to "	100
$1\frac{1}{2}$ "	"	5,	"	"	"	"	105 to "	125
$1\frac{3}{4}$ "	"	6,	"	"	"	"	130 to "	195
2 "	"	7,	"	"	"	"	200 to "	250

Rope and Iron-Strapped Tackle Blocks.

DIAMETER OF SHEAVES AND SIZE OF ROPE TAKEN BY EACH.

Lg'th of Blocks...inches	4	5	6	7	8	9	10	11	12
Diam. of Wheels..inches	$2\frac{1}{2}$	3	$3\frac{1}{2}$	$4\frac{1}{4}$	5	$5\frac{3}{4}$	$6\frac{1}{2}$	$7\frac{1}{4}$	8
Diam. of Rope....inches	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	1	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{1}{4}$

THICK MORTISE BLOCKS.

Length of Blocks.....inches	9	10	11	12	15
Diameter of Wheels.....inches	$5\frac{3}{4}$	$6\frac{1}{2}$	$7\frac{1}{4}$	8	
Diameter of Rope.....inches	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{1}{2}$	

PERKINS HORSE SHOES.

Weight expressed in ounces.

Front Shoes, No.	0	1	2	3	4	5	6	7	8
Light	13	15	17	21	24	29	35		
Medium		17	20	24	28	34	38		
Heavy		19	22	27	32	36	41	49	54
Hind Shoes, No.	0	1	2	3	4	5	6	7	8
Light	10	12	15	18	22	26	31		
Medium		14	16	20	24	28	33		
Heavy		14	17	21	25	30	34	38	43
Mule, No.	1	2	3	4	5	6	7		
Front Shoes	10	12	15	18	22	25	29		

"Ausable" Horse Shoe Nails.

STANDARD SIZES.

No.	4	5	6	7	8	9	10	12
Length in inches.	1⅝	1 11/16	2 3/32	2¼	2 7/16	2 9/16	2 11/16	3 1/16
Number in pound	276	168	138	110	96	80	73	57

WEIGHT OF IRON TIRE.—Per Set of 54 feet.

Size.	Lbs.	Size.	Lbs.	Size.	Lbs.
1 x 3/16	34	1¼ x ¼	56	1½ x 5/8	169
1 x ¼	45	1¼ x 5/16	70	1⅝ x ½	148
1 x 5/16	56	1¼ x ⅜	85	1⅝ x 5/8	183
1 x ⅜	68	1¼ x 7/16	99	1¾ x ½	158
1¼ x ¼	50	1¼ x ½	113	1¾ x 5/8	197
1¼ x 5/16	63	1⅜ x ⅜	93	1¾ x ¾	236
1¼ x ⅜	75	1⅜ x ½	124	2 x ½	180
1¼ x 7/16	88	1½ x ⅜	101	2 x 5/8	225
1¼ x ½	101	1½ x ½	135	2 x ¾	270

WEIGHT OF STEEL TIRE.—Per Set of 54 feet.

Size.	Lbs.	Size.	Lbs.	Size.	Lbs.	Size.	Lbs.	Size.	Lbs.
⅝ x 3/16	7½	⅝ x 3/32	11½	⅝ x ¼	15¼	⅝ x 3/16	22¾	⅞ x 3/32	35½
¾ x 3/32	13¼	¾ x ¼	18	¾ x 5/32	22	¾ x 3/16	27	¾ x ¼	35½
⅞ x 3/32	15¼	⅞ x ¼	20¼	⅞ x 5/32	25	⅞ x 3/16	30½	⅞ x ¼	40½
1 x ¼	23	1 x 5/32	29½	1 x 3/16	35½	1 x 7/32	42¼	1 x ¼	47½
1 x 5/16	58½	1⅛ x 3/16	40½	1⅛ x ¼	54	1⅛ x 3/16	67½	1⅛ x ⅜	81
1¼ x ¼	50	1¼ x 5/16	74	1¼ x ⅜	88½	1⅜ x ⅜	98	1½ x ⅜	107
1½ x 7/16	124	1½ x ½	142	1⅝ x ½	154	1¾ x ½	165	2 x ½	190

Have a clean fire, and weld with equal parts of Borax, Salt and Sand.

RICHARDSON'S CELEBRATED SAWS

Are Unequalled for Quality, Temper and Workmanship. Taper Ground, Thin at Back, and Perfectly True.

AND HAVE JUSTLY ATTAINED AN ENVIABLE REPUTATION.

WE MAKE A FULL LINE OF

HAND, PANEL, RIP, BACK,
COMPASS, BUTCHERS', CIRCULAR, MILL, and

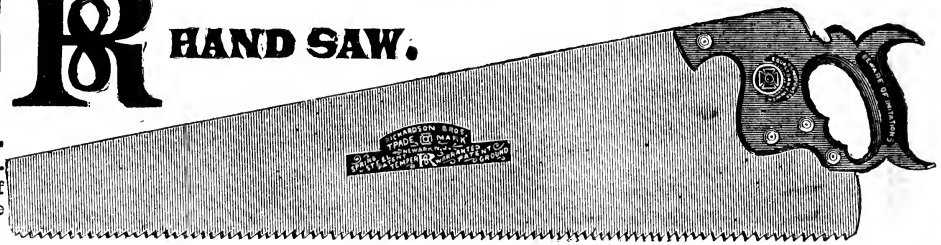
CROSS CUT SAWS.

Illustrated Catalogue sent on application.

Richardson's Trade Mark.

A Maltese Cross, with the letters B E S T, emblematical of the standing of the Saws in the Trade.

R HAND SAW.



We give an illustration of our New Improved Hand Saw, which combines the most practical improvement yet offered on Saws.

The position of the handle brings the blade or heel of the Saw nearer the hand, which makes it hang much lighter, and together with the additional Rivet, makes it the strongest and best Hand Saw in the market. We make this Saw in all lengths, and style it our R For price add $1.00 to List on regular No. 8.

SPECIAL SAWS, OR ANY SAWS NOT ON OUR LIST, MADE TO ORDER.

Richardson's Saw Works, 15 to 27 River St., Newark, N.J., U.S.A.

Standard Sizes of Circular Saw Mandrels.

No.	Diameter of Pulley.	Face of Pulley.	Diameter of Flange.	Length of Shaft.	Diameter of Shaft.	Size of Hole in Saw.
1	2½ ins.	3½ ins.	2½ ins.	14 ins.	1 1-16 in	1 in.
2	3 "	4 "	3 "	16 "	1 3-16 "	1⅛ "
3	3½ "	4½ "	3½ "	18 "	1 5-16 "	1¼ "
4	4 "	5 "	4 "	20 "	1 7-16 "	1 5-16 "
5	4½ "	5½ "	4½ "	22 "	1 7-16 "	1 5-16 "
6	5 "	6 "	5 "	24 "	1 7-16 "	1⅜ "
7	5½ "	6½ "	5½ "	26 "	1 7-16 "	1⅜ "
8	6 "	7 "	6 "	28 "	1 9-16 "	1½ "
9	7 "	8 "	6 "	32 "	1 11-16 "	1⅝ "
10	8 "	8 "	6 "	36 "	1 13-16 "	1⅞ "

When Ordering Circular Saws,

The following directions should be explicitly given:

Diameter of Saw in inches.
Thickness (or Gauge) of Saw at Rim.
Thickness (or Gauge) of Saw at Centre.
Log side, right or left hand, saw *cutting towards you.*
Number of Teeth in Saw.
Kind and number of Tooth.
Size of mandrel hole.
Size of pin hole.
Distance between pin holes from centre to centre.

Standard Gauges for Circular and Mill Saws.

Gauge.			Gauge.		
No. 4.....	¼ inch,	scant.	No. 11.....	⅛ inch,	scant.
" 5.....	7-32 "		" 12.....	3-32 "	full.
" 6.....	3-16 "	full.	" 13.....	3-32 "	scant.
" 7.....	3-16 "	scant.	" 14.....	5-64 "	full.
" 8.....	5-32 "		" 15.....	5-64 "	scant.
" 9.....	5-32 "	scant.	" 16.....	1-16 "	full.
" 10.....	⅛ "	full.			

Standard Length of Cut of Hatchets and Bench Axes.

Nos	1	2	3
Shingling	$3\frac{1}{2}$	$3\frac{7}{8}$	$4\frac{3}{8}$ inches.
Claw	$3\frac{1}{2}$	$3\frac{7}{8}$	$4\frac{3}{8}$ inches.
Half	$3\frac{1}{2}$	$3\frac{7}{8}$	$4\frac{3}{8}$ inches.
Lath	$2\frac{1}{2}$	$2\frac{3}{4}$	3 inches.

No	1	2	3	4	5	6	7	8	9
Bench	$3\frac{3}{4}$	$4\frac{1}{2}$	5	$5\frac{1}{2}$	6	$6\frac{3}{4}$	$7\frac{1}{2}$	$8\frac{1}{4}$	9 inches.

Weights of Washoe (Adz Eye) Picks.

RAILROAD PICKS.

Nos	1	2	3	4	5	6	7	8
Weight	5	$5\frac{1}{2}$	6	$6\frac{1}{2}$	7	$7\frac{1}{2}$	8	$8\frac{1}{2}$ lbs.

MINING OR DRIFTING PICKS.

Nos	1	2	3	4	5	6	7	8	9
Weight	3	$3\frac{1}{2}$	4	$4\frac{1}{2}$	5	$5\frac{1}{2}$	6	$6\frac{1}{2}$	7 lbs.

POLL PICKS.

Nos	1	2	3	4	5	6	7	8	9
Weight	$3\frac{1}{2}$	4	$4\frac{1}{2}$	5	$5\frac{1}{2}$	6	$6\frac{1}{2}$	7	$7\frac{1}{2}$ lbs.

COAL PICKS.

Nos	1	2	3	4	5	6
Weight	$3\frac{1}{2}$	4	$4\frac{1}{2}$	5	6	$6\frac{1}{2}$ lbs.

Coes' (Genuine) Wrenches.

WILL TAKE NUTS OF THE FOLLOWING SIZES:

Size of Wrench	4	6	8	10	12	15	18	21 in.
Size of Nuts	$\frac{1}{2}$	$\frac{7}{8}$	$1\frac{1}{4}$	$1\frac{3}{4}$	$2\frac{1}{8}$	$2\frac{5}{8}$	3	$4\frac{1}{8}$ in.

Cast Steel Crowbars.

Size.....Inches	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$
Usual Weight.....Lbs.	6	8	10	13	17	22	26
Usual Length.....Inches	44	48	52	55	58	66	72

See Page 100.

See Page 100.

Molasses Gates.

No.	1	2	3	4	5
Inside Diameter	13-16	⅞	1⅛	1⅜	1½
Bore	1	1⅛	1⅜	1⅝	1 13-16

John Wilson's English Butcher Knives.

LENGTH OF BLADE OF EACH NO.

No.	026	26	27	28	29	30	
Length	4¼	5	5¼	5½	6	6½	inches.

No.	43	44	45	46	47	48	49	86
Length	7	8	9	10	11	12	13	14 ins.

Eley Bros.' ("E. B.") Percussion Caps

ARE NUMBERED IN THIS MANNER:

Smallest..	No.	9	24	10	11	18	12	13	14	..Largest.

English Gun Gauge.

SIZES EXPRESSED IN PARTS OF AN INCH.

	Number.											
Bore..	5	6	7	9	11	15	19	25	36	52	90	140	3 0
Inch..	1	15-16	⅞	13-16	¾	11-16	⅝	9-16	½	7-16	⅜	5-16	¼

The Sizes of Skates

COMPARE WITH SIZES OF SHOES AS FOLLOWS:

Skates, Inches..	7	7½	8	8½	9	9½	10	10½	11	11½
Shoes, No.	9½	11	12½	1	2½	4	5½	7½	9	10½

Plate and Bedstead Casters.

SIZE, IN INCHES, OF WHEELS OF EACH.

Plate.....No	1	2	3	4	5	6	7
Size	⅞	1	1⅛	1¼	1⅜	1 7-16	1½

Bedstead, Old No.	1⅝.0	1⅝.1	1⅝.2	2 in 0	2 in 1	2 in 2	2 in heavy.
New "	101	102	103	104	105	106	107
Size	1⅜	1½	1⅝	1¾	1⅞	2	2¼

Hatter's Size Measure.

To obtain the correct size of the head, use a strip of paper—newspaper will do. Draw it tightly around the largest part of the head, and have the ends just meet. Then measure the length of the paper and the figures below will give you the size according to hatter's measure. An eighth of an inch either way will make no difference. These measures will answer for any style of hat or cap made:

18¾ inches is	5⅞	22¼ inches is	7
19 "	6	22½ "	7⅛
19¼ "	6⅛	23 "	7¼
19½ "	6¼	23¼ "	7⅜
20¼ "	6⅜	23½ "	7½
20½ "	6½	24 "	7⅝
21 "	6⅝	24½ "	7¾
21¼ "	6¾	25 "	7⅞
21½ "	6⅞	25¼ "	8

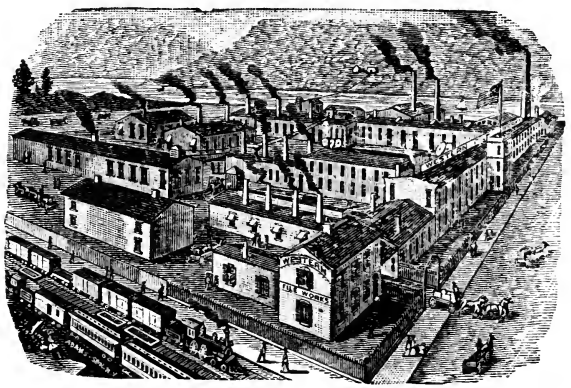
"WESTERN" FILES,

Warranted the Best in the Market,

FOR SALE BY

Iron and Hardware Dealers

THROUGHOUT THE UNITED STATES AND CANADA.



THE NEW HORSE RASP, "WESTERN '88"

SUPERIOR QUALITY.

WESTERN FILE CO., Limited,

BEAVER FALLS,

PENNSYLVANIA.

REGULAR STANDARD SIZES OF FILES.

[Expressed as nearly as possible without the use of Decimals]

Length.	Mill-Saw Files.	Flat.	Hand.	Half Round.	Round and Square.	Cabinet Files.	Regular Taper Files.	Slim Taper Files.	Pit Saw Files.	Warding Files.
3 in.	$\frac{1}{32}\times\frac{1}{16}$ in.	$\frac{5}{16}\times\frac{5}{64}$ in.	$\frac{7}{16}\times\frac{3}{32}$ in.	$\frac{5}{16}\times\frac{3}{32}$ in.	$\frac{1}{8}$ in.		$\frac{1}{4}$ in.	$\frac{3}{16}$ in.	$\frac{1}{4}\times\frac{1}{8}$ in.	$\frac{3}{8}\times\frac{3}{64}$ in.
$3\frac{1}{2}$ in.							$\frac{9}{32}$ in.	$\frac{7}{32}$ in.	$\frac{9}{32}\times\frac{9}{64}$ in.	$\frac{7}{16}\times\frac{3}{64}$ in.
4 in.	$\frac{7}{16}\times\frac{5}{64}$ in.	$\frac{7}{16}\times\frac{3}{32}$ in.	$\frac{1}{2}\times\frac{1}{8}$ in.	$\frac{7}{16}\times\frac{1}{8}$ in.	$\frac{5}{32}$ in.		$\frac{3}{8}$ in.	$\frac{1}{4}$ in.	$\frac{5}{16}\times\frac{5}{32}$ in.	$\frac{1}{2}\times\frac{1}{16}$ in.
$4\frac{1}{2}$ in.							$\frac{13}{32}$ in.	$\frac{9}{32}$ in.	$\frac{11}{32}\times\frac{11}{64}$ in.	$\frac{1}{2}\times\frac{1}{16}$ in.
5 in.	$\frac{1}{2}\times\frac{3}{32}$ in.	$\frac{1}{2}\times\frac{1}{8}$ in.	$\frac{5}{8}\times\frac{5}{32}$ in.	$\frac{1}{2}\times\frac{5}{32}$ in.	$\frac{3}{16}$ in.		$\frac{7}{16}$ in.	$\frac{9}{32}$ in.	$\frac{3}{8}\times\frac{3}{16}$ in.	$\frac{1}{2}\times\frac{5}{64}$ in.
$5\frac{1}{2}$ in.							$\frac{15}{32}$ in.	$\frac{11}{32}$ in.		$\frac{5}{8}\times\frac{5}{64}$ in.
6 in.	$\frac{5}{8}\times\frac{1}{8}$ in. scant.	$\frac{5}{8}\times\frac{5}{32}$ in.	$\frac{3}{4}\times\frac{3}{16}$ in.	$\frac{5}{8}\times\frac{3}{16}$ in.	$\frac{7}{32}$ in.	$\frac{11}{16}\times\frac{9}{64}$ in.	$\frac{1}{2}$ in.	$\frac{3}{8}$ in.	$\frac{7}{16}\times\frac{7}{32}$ in.	$\frac{5}{8}\times\frac{3}{32}$ in.
7 in.	$\frac{3}{4}\times\frac{1}{8}$ in. full.	$\frac{3}{4}\times\frac{3}{16}$ in.	$1\frac{3}{16}\times\frac{3}{64}$ in.	$\frac{3}{4}\times\frac{5}{64}$ in.	$\frac{1}{4}$ in.	$\frac{13}{16}\times\frac{5}{32}$ in.	$\frac{9}{16}$ in.	$\frac{7}{16}$ in.	$\frac{1}{2}\times\frac{1}{4}$ in.	
8 in.	$\frac{13}{16}\times\frac{5}{32}$ in.	$\frac{13}{16}\times\frac{13}{64}$ in.	$\frac{7}{8}\times\frac{7}{32}$ in.	$\frac{13}{16}\times\frac{15}{64}$ in.	$\frac{9}{32}$ in.	$\frac{7}{8}\times\frac{11}{64}$ in.	$\frac{5}{8}$ in.	$\frac{1}{2}$ in.	$\frac{9}{16}\times\frac{9}{32}$ in.	
9 in.	$\frac{7}{8}\times\frac{11}{64}$ in.	$\frac{7}{8}\times\frac{7}{32}$ in.	1 $\times\frac{1}{4}$ in.	$\frac{7}{8}\times\frac{1}{4}$ in.	$\frac{5}{16}$ in.	1 $\times\frac{3}{16}$ in.				
10 in.	1 $\times\frac{3}{16}$ in.	1 $\times\frac{1}{4}$ in.	$1\frac{3}{32}\times\frac{9}{32}$ in.	1 $\times\frac{9}{32}$ in.	$\frac{3}{8}$ in.	1 $\frac{1}{8}\times\frac{7}{32}$ in.				
11 in.	$1\frac{3}{32}\times\frac{13}{64}$ in.	$1\frac{3}{32}\times\frac{9}{32}$ in.	$1\frac{3}{16}\times\frac{19}{64}$ in.	$1\frac{3}{32}\times\frac{5}{16}$ in.	$\frac{7}{16}$ in.	$1\frac{3}{16}\times\frac{1}{4}$ in.				
12 in.	$1\frac{3}{16}\times\frac{7}{32}$ in.	$1\frac{3}{16}\times\frac{19}{64}$ in.	$1\frac{1}{4}\times\frac{5}{16}$ in.	$1\frac{3}{16}\times\frac{11}{32}$ in.	$\frac{1}{2}$ in.	1 $\frac{1}{4}\times\frac{1}{4}$ in.				
13 in.	$1\frac{1}{4}\times\frac{15}{64}$ in.	$1\frac{1}{4}\times\frac{5}{16}$ in.	$1\frac{11}{32}\times\frac{11}{32}$ in.	$1\frac{1}{4}\times\frac{3}{8}$ in.	$\frac{9}{16}$ in.					
14 in.	$1\frac{11}{32}\times\frac{1}{4}$ in.	$1\frac{11}{32}\times\frac{11}{32}$ in.	$1\frac{7}{16}\times\frac{3}{8}$ in.	$1\frac{11}{32}\times\frac{13}{32}$ in.	$\frac{5}{8}$ in.					
15 in.	$1\frac{7}{16}\times\frac{9}{32}$ in.	$1\frac{7}{16}\times\frac{3}{8}$ in.	$1\frac{1}{2}\times\frac{13}{32}$ in.	$1\frac{7}{16}\times\frac{7}{16}$ in.	$\frac{11}{32}$ in.					
16 in.	$1\frac{1}{2}\times\frac{19}{64}$ in.	$1\frac{1}{2}\times\frac{13}{32}$ in.	$1\frac{9}{16}\times\frac{7}{16}$ in.	$1\frac{1}{2}\times\frac{15}{32}$ in.	$\frac{3}{4}$ in.					

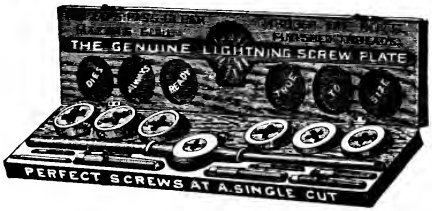
This Table of Sizes will give consumers, and all persons concerned in the use of Files, a fair idea of the sizes of the full parts of Files most generally used. It will also be found useful to persons who generally want Files of a certain width or thickness, and who may not know the corresponding length of such Files.

WILEY & RUSSELL MFG. CO.

MANUFACTURERS OF PATENT

Screw-Cutting and Other Labor-Saving

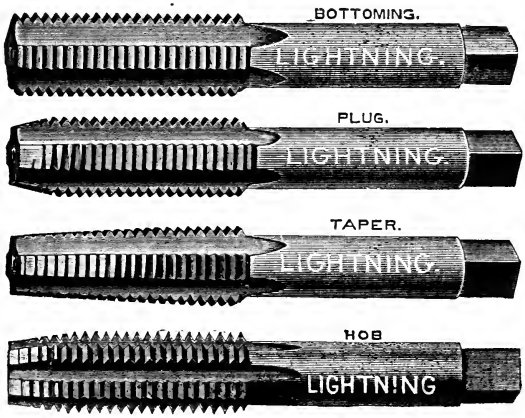
MACHINERY AND TOOLS.



"LIGHTNING." (TRADE MARK.)

"GREEN RIVER." (TRADE MARK.)

THE CELEBRATED LIGHTNING AND GREEN RIVER SCREW PLATES, LIGHTNING BOLT-CUTTERS FOR HAND AND POWER USE, FINE TAPS AND DIES, REAMERS AND COUNTERSINKS, PUNCHING PRESSES, GREEN RIVER DRILLING MACHINES, TIRE-BENDERS, TIRE-UPSETTERS, ETC., ETC.



SEND FOR NEW PRICE-LIST.

PROPORTIONS FOR UNITED STATES STANDARD

SCREW THREADS AND NUTS.

FROM HOOPES & TOWNSEND.

Diam. of Screw.	Thr'ads per inch.	Diamet'r at root of Thread.	Short Diame'tr	Long Diamet'r	Long Diamet'r	Thick-ness.
1/4	20	.185	1/2	37/64	7/10	1/4
5/16	18	.240	19/32	11/16	11/32	5/16
3/8	16	.294	11/16	51/64	63/64	3/8
7/16	14	.344	23/32	29/32	1 7/64	7/16
1/2	13	.400	7/8	1	1 5/64	1/2
9/16	12	.454	31/32	1 1/32	1 23/64	9/16
5/8	11	.507	1 1/16	1 7/32	1 1/2	5/8
3/4	10	.620	1 1/4	1 7/16	1 59/64	3/4
7/8	9	.731	1 7/16	1 31/32	2 7/32	7/8
1	8	.837	1 5/8	1 7/8	2 1/64	1
1 1/8	7	.940	1 13/16	2 3/32	2 9/16	1 1/8
1 1/4	7	1.065	2	2 5/32	2 53/64	1 1/4
1 3/8	6	1.160	2 3/16	2 17/32	3 3/32	1 3/8
1 1/2	6	1.284	2 3/8	2 23/32	3 23/64	1 1/2
1 5/8	5 1/2	1.389	2 9/16	2 31/32	3 5/8	1 5/8
1 3/4	5	1.491	2 3/4	3 3/16	3 57/64	1 3/4
1 7/8	5	1.616	2 15/16	3 13/32	4 5/32	1 7/8
2	4 1/2	1.712	3 1/8	3 5/8	4 21/64	2
2 1/4	4 1/2	1.962	3 1/2	4 1/16	4 61/64	2 1/4
2 1/2	4	2.176	3 7/8	4 1/2	5 31/64	2 1/2
2 3/4	4	2.426	4 1/4	4 29/32	6	2 3/4
3	3 1/2	2.629	4 5/8	5 3/8	6 13/32	3
3 1/4	3 1/2	2.879	5	5 13/16	7 1/16	3 1/4
3 1/2	3 1/4	3.100	5 3/8	6 7/32	7 39/64	3 1/2
3 3/4	3	3.317	5 3/4	6 23/32	8 1/8	3 3/4
4	3	3.567	6 1/8	7 3/32	8 41/64	4

BLOCK TIN PIPE.

CALIBER.	Wt. per ft		CALIBER.	Wt. per ft	
	LBS.	OZ.		LBS.	OZ.
1/8 in. strong	.....	2 1/2	1/2 in. double ex-strong	.....	15
1/4 inch ex-strong	.....	5	5/8 in. ex-strong	.....	9
double ex-strong	.....	6	double ex-strong	.....	14
5/16 in. dou'le ex-strong	.....	6 1/2	3/4 in. ex-strong	.....	11
3/8 in. ex-strong	.....	6	double ex-strong	1	0
double ex-strong	.....	8	1 in. double ex-strong	.....	14
1/2 in. strong	.....	6 1/2	double ex-strong	1	4
ex-strong	.....	10			

CAST IRON BALLS.—WEIGHT.

	LBS.		LBS.		LBS.
2 in. diam.	1.09	4 1/2 in. diam	12.42	6 1/2 in. diam.	37.44
2 1/2 in. diam.	2.13	5 in. diam	17.04	7 in. diam.	46.76
3 in. diam.	3.68	5 1/2 in. diam	22.68	7 1/2 in. diam.	57.52
3 1/2 in. diam.	5.84	6 in. diam	29.48	8 in. diam.	69.81
4 in. diam.	8.73				

TABLE

SHOWING THE AVERAGE NUMBER OF COLD-PRESSED NUTS IN A KEG, 150 LBS. EACH, SQUARE AND HEXAGON, OF STANDARD SIZES,

As adopted by "The Association of Bolt and Nut Manufacturers of U. S."

Width.	Thickness.	Hole.	Bolt.	No. of Square.	No. of Hexagon
1/2	5/16	3/8	1/4	45,000	
9/16	3/8	13/32	5/16	22,500	
5/8	7/16	7/16	1/4	10,000	10,500
11/16	1/2	15/32	5/16	5,106	6,666
3/4	9/16	1/2	3/8	2,727	4,528
13/16	5/8	17/32	7/16	1,904	2,057
7/8	11/16	9/16	1/2	1,695	1,890
15/16	3/4	19/32	9/16	1,218	1,538
1	7/8	5/8	5/8	1,016	1,245
1 1/16	15/16	21/32	11/16	885	957
1 1/8	1	11/16	3/4	638	740
1 3/16	1 1/16	23/32	13/16	450	555
1 1/4	1 1/8	3/4	7/8	368	430
1 5/16	1 3/16	25/32	15/16	260	270
1 3/8	1 1/4	13/16	1	243	252
1 7/16	1 5/16	27/32	1 1/16	249	257
1 1/2	1 3/8	7/8	1 1/8	163	204
1 9/16	1 7/16	29/32	1 3/16	143	168
1 5/8	1 1/2	15/16	1 1/4	109	150
1 11/16	1 9/16	31/32	1 5/16	85	120
1 3/4	1 5/8	1	1 3/8	84	93
1 13/16	1 11/16	1 1/32	1 7/16	55	60
1 7/8	1 3/4	1 1/16	1 1/2	51	56
1 15/16	1 13/16	1 3/32	1 9/16	39	44
2	1 7/8	1 1/8	1 5/8	32	35
2 1/16	1 15/16	1 5/32	1 11/16	28	30
2 1/8	2	1 3/16	1 3/4	20	22

Taper and Plug Taps---Standard Number of Threads to the Inch.

Size Inches	RIGHT HAND.								LEFT HAND.	
1/8					30	32				
3/16				24	26	28				
1/4			16	18	20	22	24	26		
5/16		14	16	18	20	22				
3/8	12	14	16	18	20					
7/16	10	12	14	16	18				14	
1/2	10	12	14	16	18				12	14
9/16		12	14						12	
5/8	10	11	12	14	16				10	12
3/4	7	8	9	10	12	14			10	12
7/8	8	9	10						9	
1	7	8	9	10					8	9
1 1/4	6	7	8	9					8	9
1 1/2	6	7	8						6	7.8

TABLE

Showing the Average Number of Washers in a Keg of 150 Pounds, of Each Standard Size.

AS ADOPTED BY

"The Association of Bolt and Nut Manufacturers of the United States."

Diameter.	Size of Hole.	Thicknes Wire Gauge.	Size of Bolt	No. in 150 pounds.
$\frac{1}{4}$	$\frac{1}{4}$	No. 18	$\frac{3}{16}$	80,000
$\frac{5}{16}$	$\frac{5}{16}$	" 16	$\frac{1}{4}$	34,285
$\frac{3}{8}$	$\frac{5}{16}$	" 16	$\frac{1}{4}$	22,000
$\frac{7}{16}$	$\frac{9}{32}$	" 16	$\frac{5}{16}$	18,500
1	$\frac{7}{16}$	" 14	$\frac{3}{8}$	10,550
$1\frac{1}{4}$	$\frac{1}{2}$	" 14	$\frac{7}{16}$	7,500
$1\frac{3}{8}$	$\frac{9}{16}$	" 12	$\frac{1}{2}$	4,500
$1\frac{1}{2}$	$\frac{5}{8}$	" 12	$\frac{9}{16}$	3,850
$1\frac{3}{4}$	$\frac{11}{16}$	" 10	$\frac{5}{8}$	2,500
2	$\frac{13}{16}$	" 10	$\frac{3}{4}$	1,600
$2\frac{1}{4}$	$\frac{15}{16}$	" 9	$\frac{7}{8}$	1,300
$2\frac{1}{2}$	$1\frac{1}{16}$	" 9	1	950
$2\frac{3}{4}$	$1\frac{1}{4}$	" 9	$1\frac{1}{8}$	700
3	$1\frac{3}{8}$	" 9	$1\frac{1}{4}$	550
$3\frac{1}{2}$	$1\frac{1}{2}$	" 9	$1\frac{3}{8}$	450

Standard Sizes of Heads for Bolts.

Diam. of Bolt.	Square Head.		Hexagon Head		Button Head.		Countersunk Head.	
	WIDE.	THICK.	WIDE.	THICK.	WIDE.	THICK.	WIDE.	THICK
$\frac{1}{4}$	$\frac{7}{16}$	$\frac{3}{16}$	$\frac{7}{16}$	$\frac{1}{4}$	$\frac{11}{16}$	$\frac{5}{32}$	$\frac{1}{2}$	$\frac{3}{16}$
$\frac{5}{16}$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{5}{16}$	$\frac{13}{16}$	$\frac{5}{32}$	$\frac{5}{8}$	$\frac{1}{4}$
$\frac{3}{8}$	$\frac{5}{8}$	$\frac{5}{16}$	$\frac{5}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	$\frac{1}{4}$	$\frac{11}{16}$	$\frac{1}{4}$
$\frac{7}{16}$	$\frac{11}{16}$	$\frac{3}{8}$	$\frac{11}{16}$	$\frac{7}{16}$	1	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{4}$
$\frac{1}{2}$	$\frac{13}{16}$	$\frac{7}{16}$	$\frac{13}{16}$	$\frac{1}{2}$	$1\frac{1}{8}$	$\frac{5}{16}$	$\frac{7}{8}$	$\frac{1}{4}$
$\frac{9}{16}$	$\frac{7}{8}$	$\frac{1}{2}$	$\frac{7}{8}$	$\frac{9}{16}$	$1\frac{1}{4}$	$\frac{5}{16}$	$1\frac{1}{16}$	$\frac{5}{16}$
$\frac{5}{8}$	1	$\frac{9}{16}$	1	$\frac{5}{8}$	$1\frac{3}{8}$	$\frac{7}{16}$	$1\frac{1}{8}$	$\frac{5}{16}$
$\frac{3}{4}$	$1\frac{1}{16}$	$\frac{5}{8}$	$1\frac{1}{16}$	$\frac{3}{4}$	$1\frac{1}{2}$	$\frac{1}{2}$	$1\frac{3}{8}$	$\frac{3}{8}$
$\frac{7}{8}$	$1\frac{3}{16}$	$\frac{3}{4}$	$1\frac{3}{16}$	$\frac{7}{8}$	$1\frac{3}{4}$	$\frac{5}{8}$	$1\frac{1}{2}$	$\frac{3}{8}$
1	$1\frac{5}{16}$	$\frac{7}{8}$	$1\frac{5}{16}$	1	$2\frac{1}{8}$	$\frac{3}{4}$		
$1\frac{1}{8}$	$1\frac{7}{16}$	1	$1\frac{7}{16}$	$1\frac{1}{8}$				
$1\frac{1}{4}$	$1\frac{9}{16}$	$1\frac{1}{8}$	$1\frac{9}{16}$	$1\frac{1}{4}$				
$1\frac{3}{8}$	$1\frac{11}{16}$	$1\frac{1}{4}$	$1\frac{11}{16}$	$1\frac{3}{8}$				
$1\frac{1}{2}$	$1\frac{13}{16}$	$1\frac{3}{8}$	$1\frac{13}{16}$	$1\frac{1}{2}$				

APPROXIMATE WEIGHTS OF STRAP AND T HINGES.

Weight per dozen. Furnished by Stanley Works.

HEAVY STRAP HINGES.

Size....	4	5	6	8	10	12	14	16	ins.
Weight.	6¾	10½	19½	32½	55¼	74½	89¼	108½	lbs.

EXTRA HEAVY T HINGES.

Size.....	6	8	10	12	14	16	ins.
Weight	20¾	34 ¾	54	78	83½	87¾	lbs.

STRAP AND T HINGES ARE COUNTERSUNK FOR SCREWS.

Inches		3	4	5	6	8	10	12	14	16	18
Light Strap.....	Size Screws	6	7	8	9	10	10	12	13	13	
Heavy Strap.....	"		9	9	11	12	14	16	16	16	
Light T...	"	7	7	8	8	9	10	11	12		
Heavy T.....	"				9	10	11	12	13	13	13
Extra Heavy T	"			10	11	13	14	16	16	16	
Hinge Hasps.....	"	6	7		9	10	10	12			

WROUGHT BUTTS—Countersunk for Screws.

TABLE BUTTS AND BACK FLAPS.

Inches	⅞	1	1⅛	1¼	1⅜	1½	1⅝	1¾	2⅛	2
Size Screw.....	6	6	7	7	7	8	8	9	9	9

NARROW WROUGHT BUTTS.

Inches..	1	1¼	1½	1¾	2	2¼	2½	2¾	3	3¼	3½	3¾	4	4½	5	5½	6
Screws..	5	6	7	7	8	8	9	9	10	12	12	12	12	14	14	14	14

LIGHT NARROW AND LIGHT LOOSE PIN.

Inch	¾	1	1¼	1½	1¾	2	2¼	2½	3
Screws.....	2	3	3	5	5	6	6	6	7

LOOSE PIN OR BROAD.

Size.....	2x2 to 2½x2	2½x2½ to 3x3	3x3½	3½x3 to 4½x4	4½x4½ to 5½	5x5 to 6x7
Screws.....	9	10	11	12	13	14

CAST BUTTS

ARE COUNTERSUNK FOR SCREWS AS FOLLOWS:

NARROW, FAST OR LOOSE JOINT.

Inch.....	1⅛	1¾	2	2¼	2⅝	3	3¼	3½	4	4½	5	6
Screws	6	7	7	8	8	8	10	10	10	12	14	12

PARLIAMENT.

Inch.....	2½ to 3½	3¾ and 4	4½ to 7½	8 and 8½
Screw	8	10	11	13

BROAD, FAST, AND LOOSE JOINT AND LOOSE PIN.

Inch.....	2x2 to 2½x3	3x2½ to 3½x3½	3½x4
Screw	8	10	11

Inch	3½x5	4x3	4x3½ to 4½x4½	4½x5 and upwards
Screw.....	10	10	11	13

WROUGHT BRASS BUTTS.

Width when Open, and Sizes of Screws Required.

WIDTH OF BRASS BUTTS, WHEN OPEN.

Size.....Inches	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4
Narrow.....Width	5/8	5/8	5/8	3/4	3/4	7/8	7/8	7/8	7/8
Middle.....	3/4	3/4	3/4	7/8	7/8	1	1	1	1
Broad.....	7/8	7/8	7/8	1	1	1 1/8	1 1/8	1 1/8	1 1/8
Desk.....	1 1/4	1 3/8	1 5/8	1 3/4	1 7/8	2	2 1/8	2 1/4	2 1/2

Size.....Inches	1 7/8	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	...
Narrow.....Width	1	1	1 1/8	1 1/4	1 3/8	1 5/8	1 3/4	2	...
Middle.....	1 1/8	1 1/8	1 1/4	1 3/8	1 1/2	1 3/4	1 7/8	2 1/8	...
Broad.....	1 1/4	1 1/4	1 3/8	1 1/2	1 5/8	1 7/8	2	2 1/4	..
Desk.....	2 3/4	3	..	...	...	...	...	...	...

BRASS BUTTS ARE COUNTERSUNK FOR SCREWS AS FOLLOWS:

Size.....Inch	1/2	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8
Narrow....Size of Screw	0	1	1	2	2	3	4	4	4
Middle.....	0	1	1	2	2	3	4	4	4
Broad.....	0	1	1	2	2	3	4	4	4
Desk.....	1	2	2	4	4	4	4	5	5

Size.....Inch	1 3/4	1 7/8	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2
Narrow....Size of Screw	4	5	5	5	6	6	7	7	8
Middle.....	4	5	5	5	6	6	7	7	8
Broad.....	4	5	5	5	6	7	7	7	8
Desk.....	6	6	7	...	...	...	...	...	...

EMERY AND CORUNDUM

ARE RANKED OR GRADED AS FOLLOWS:

Nos.	8–10.....	Represents a Wood rasp.
"	16–20.....	" Rough file.
"	24–30.....	" Middle cut file.
"	36–40.....	" Bastard cut file.
"	46–60.....	" Second cut file.
"	70–80.....	" Smooth cut file.
"	90–100.....	" Superfine cut file.
"	120–FFF.....	" Dead smooth file.

Baeder & Adamson's Emery Paper and Cloth

COMPARE WITH GRADE AS FOLLOWS:

Nos.	000	00	0	100	1/2	1	1 1/2	2	2 1/2	3
Emery....	Crocus	Flour	120	100	90	80	70	60	54	46

IF YOU SELL SCREWS, BOLTS, OR SHOT

It will be to your advantage to use

The Westphal Revolving Case,

MADE OF IRON, WITH GLASS FRONTS.

MOST CONVENIENT OF ANY.

FOR PRICES AND CIRCULARS ADDRESS

THE SCHENCK ADJUSTABLE FIRE BACK CO., CHICAGO.

CLOSES ON OUTSIDE OF NOSE.

Only Double Ring Invented.

Champion Hog Ringer,

RINGS AND HOLDER.

The only Ring that will effectually keep hogs from rooting. No sharp points in the nose.

Only Single Ring Ever Invented that Closes on the Outside of the Nose.

BROWN'S ELLIPTICAL RING

AND TRIPLE GROOVE HOG AND PIG RINGER.

No sharp points in the nose to keep it sore.

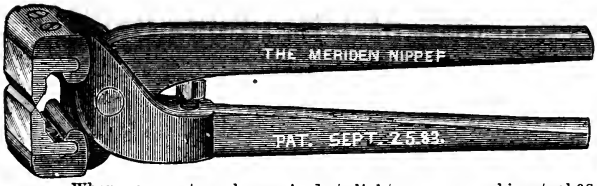
CHAMBERS, BERING, QUINLAN CO.

DECATUR, ILLINOIS.

DIFFERENT STANDARDS FOR WIRE GAUGE IN USE IN THE UNITED STATES.

Dimensions of Sizes, in Decimal Parts of an Inch.

Number of Wire Gauge.	American, or Brown & Sharpe.	Birmingham, or Stubs's.	Washb'n & Moen Mfg. Co., Worcester, Mass.	Trenton Iron Co., Trenton, N. J.	G. W. Prentiss, Hoyoke, Mass.	Old English from Brass Mfrs'. List.	Number of Wire Gauge.
000000	.....	....	.46	....	....	....	000000
00000	.....	...	.43	.45	. .	....	00000
0000	.46	.454	.393	.4	....	....	0000
000	.40964	.425	.362	.36	.3586	....	000
00	.3648	.38	.331	.33	.3282	....	00
0	.32495	.34	.307	.305	.2994	....	0
1	.2893	.3	.283	.285	.2777	....	1
2	.25763	.284	.263	.265	.2591	....	2
3	.22942	.259	.244	.245	.2401	...	3
4	.20431	.238	.225	.225	.223	....	4
5	.18194	.22	.207	205	.2047	....	5
6	.16202	.203	.192	.19	1885	....	6
7	.14428	.18	.177	.175	1758	....	7
8	.12849	.165	.162	.16	.1605	....	8
9	.11443	.148	.148	.145	.1471	....	9
10	.10189	.134	.135	.13	.1351	....	10
11	.090742	.12	.12	.1175	.1205	....	11
12	.080808	.109	.105	.105	1065	....	12
13	.071961	.095	.092	.0925	.0928	....	13
14	.064084	.083	.08	.08	.0816	.083	14
15	.057068	.072	.072	.07	.0726	.072	15
16	.05082	.065	.063	.061	.0627	.065	16
17	.045257	.058	.054	.0525	.0546	.058	17
18	.040303	.049	.047	.045	.0478	.049	18
19	.03589	.042	.041	.04	.0411	.04	19
20	.031961	.035	.035	.035	.0351	.035	20
21	.028462	.032	.032	.031	.0321	.0315	21
22	.025347	.028	.028	.028	.029	.0295	22
23	.022571	.025	.025	.025	.0261	.027	23
24	.0201	.022	.023	.0225	.0231	.025	24
25	.0179	.02	.02	.02	.0212	.023	25
26	.01594	.018	.018	.018	.0194	.0205	26
27	.014195	.016	.017	.017	.0182	.01875	27
28	.012641	.014	.016	.016	.017	.0165	28
29	.011257	.013	.015	.015	.0163	.0155	29
30	.010025	.012	.014	.014	.0156	.01375	30
31	.008928	.01	.0135	013	.0146	.01225	31
32	.00795	.009	.013	.012	.0136	.01125	32
33	.00708	.008	.011	.011	.013	.01025	33
34	.006304	.007	.01	.01	.0118	.0095	34
35	.005614	.005	.0095	.0095	.0109	.009	35
36	.005	.004	.009	.009	.01	.0075	36
37	.004453	....	.0085	.0085	.0095	.0065	37
38	.003965	....	.008	.008	.009	.00575	38
39	.003531	....	.0075	.0075	.0083	.005	39
40	.003144	....	.007	.007	.0078	.0045	40



MERIDEN

Cutting Nippers.

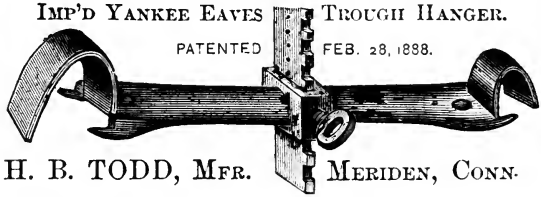
The cutting edges will stand the hardest use and are much more DURABLE than any other made.

When worn out can be repaired at slight expense, making tool as good as new.

THE YANKEE EAVES TROUGH HANGERS

Have stood the test of the New England climate for the last 15 years. Twice as many of the so-called cheap Hangers are required on a trough to give the same strength. These are much stronger than any other, are more convenient to put up, easily adjusted, in short a perfect article for hanging Eaves Troughs. Any tinner giving them a fair trial will use no other at any price.

IMP'D YANKEE EAVES TROUGH HANGER.



H. B. TODD, MFR. MERIDEN, CONN.

We shall soon have agents at all central points in the United States and Canada. If your wholesale dealer doesn't have them write us, and we will give you the address of our nearest agents, so you can order from them and save freight. Mention where you saw this advertisement.

Northfield Knife Co.

MANUFACTURERS OF

◆POCKET CUTLERY◆

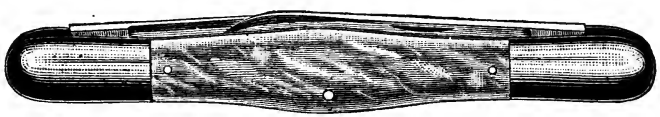
WITH HAND-FORGED BLADES ONLY.

SHEARS AND RAZORS.

NORTHFIELD, CONN.

PREMIUMS AWARDED FOR EXCELLENCE:

Centennial Exhibition, Phila., 1876. Exposition Universelle, Paris, 1878. International Exhibition, Melbourne, 1881.



Size, Weight, Length and Strength of Iron Wire.

BIRMINGHAM WIRE GAUGE.

Wire Gauge.	Diameter.	Weight of 100 Yards.	Weight of 1 mile.	Length of 1 Bundle.	Length of 1 Cwt.	Direct Strain. Area of Section.	Direct Strain. Breaking Weight.
No.	Inches.	Lbs.	Lbs.	Yards.	Yards.	Sq. in,	Lbs.
5-0	0 546	161 00	2830	39	70	0 163	13070
4-0	0 425	140 00	2460	45	80	0 142	11350
3-0	0 394	120 00	2113	52	93	0 122	9755
2-0	0 363	102 00	1794	62	110	0 103	8280
0	0 331	84 72	1490	74	132	0 086	6880
1	0 300	68 75	1210	91	162	0 071	5650
2	0 280	59 90	1054	105	187	0 062	4930
3	0 260	51 65	909	121	215	0 053	4250
4	0 240	44 00	775	143	255	0 045	3620
5	0 220	37 00	651	170	303	0 038	3040
6	0 200	30 56	538	203	361	0 031	2510
7	0 185	26 15	461	239	428	0 0265	2220
8	0 170	22 10	389	286	509	0 023	1840
9	0 155	18 36	323	342	609	0 0195	1560
10	0 140	14 97	264	420	747	0 016	1280
11	0 125	11 95	211	529	939	0 0125	1000
12	0 110	9 24	163	700	1244	0 010	800
13	0 095	7 05	124	893	1589	0 0071	568
14	0 085	5 51	97	1142	2031	0 0057	456
15	0 075	4 29	76	1468	2608	0 0044	352
16	0 065	3 22	57	1954	3473	0 0033	264
17	0 057	2 48	44	2540	4515	0 0026	208
18	0 050	1 91	34	3150	5600	0 0020	160
19	0 045	1 55	27	4085	7246	0 0016	128
20	0 040	1 22	21	4912	9168	0 0013	104
21	0 035	0 94	17	6416	11980	0 0010	80
22	0 030	0 69	12	8736	16300	0 0007	56

Sizes Expressed in Fractions of an Inch.

15-32 in.—No. 5-0 full
7-16 in.—No. 4-0 full
13-32 in.—No. 3-0 full
3-8 in.—No. 2-0 full
11-32 in.—No. 0 full
5-16 in.—No. 1 full.
9-32 in.—No. 2
1-4 in.—No. 3½
7-32 in.—No. 5
3-16 in.—No. 7
5-32 in.—No. 9
1-8 in —No. 11
1-10 in —No. 13 full
1-12 in —No. 14
1-16 in.—No. 16
1-32 in.—No. 22

Telegraph and Telephone Wire.

FROM TRENTON IRON COMPANY LIST.

WEIGHT PER MILE-OHM.—This term is to be understood as distinguishing the *resistance of material* only, and means the weight of such material required per mile to give the resistance of one ohm. To ascertain the mileage resistance of any wire, divide the "weight per mile-ohm" by the weight of the wire per mile. Thus in a grade of Extra Best Best, of which the weight per mile-ohm is 5,000, the mileage resistance of No. 6 (weight per mile 525 lbs.) would be about 9½ ohms; and No. 14 steel wire, 6,500 lbs., weight per mile-ohm (95 lbs. weight per mile), would show about 69 ohms.

The grades of LINE WIRE are generally known to manufacturers, consumers, and the trade in this country, as "Extra Best Best" (E. B. B.), "Best Best" (B. B.), "Best" (B.), and "Steel."

The "Extra Best Best" is made of the very best iron, as nearly pure as any commercial iron, soft, tough, uniform, and of very high conductivity, its weight per mile-ohm being about 5,000 lbs.

The "Best Best" is of excellent iron, showing in mechanical tests almost as good results as the E. B. B., but not quite as soft, and being somewhat lower in conductivity; weight per mile-ohm about 5,700 lbs.

Some manufacturers have ceased to make the grade known as "Best"—which term has become to some extent a misnomer, as it has been much applied to inferior wire hardly suited for telegraphic purposes, and having a weight per mile-ohm of 6,000 to 7,000 lbs. It is found that wire made from Bessemer or Open-Hearth Steel, low in carbon, gives better satisfaction, being tougher and stronger than iron wire that can be furnished at an equal price per pound, and offering no more resistance to the electric current. This "Steel" wire is well suited for Telephone or short Telegraph Lines, and the weight per mile-ohm is about 6,500 lbs.

The following are (approximately) the weights per mile of various sizes of Galvanized Telegraph Wire, drawn by Trenton Iron Co.'s gauge:

No.	4,	5,	6,	7,	8,	9,	10,	11,	12,	13,	14,
Lbs.	720,	610,	525,	450,	375,	310,	250,	200,	160,	125,	95.

Telegraph Wire is frequently made by Birmingham wire gauge, but wire of *any desired weight per mile* can be made to order.

Sizes of Wire Used in Telegraph and Telephone Lines.

No. 4. Has not been much used until recently; is now used on important lines where the multiplex systems are applied.
No. 5. Little used in the United States.
No. 6. Used for important circuits between cities.
No. 8. Medium size for circuits of 400 miles or less.
No. 9. For similar locations to No. 8, but on somewhat shorter circuits; until lately was the size most largely used in this country.
No. 10. } For shorter circuits, railway telegraphs, private lines, police and fire alarm
No. 11. } lines, &c.
No. 12. For telephone lines, police and fire alarm lines, &c.
No. 13. } For telephone lines and short private lines; steel wire is used most generally in
No. 14. } these sizes.

THE COATING OF TELEGRAPH WIRE with zinc as a protection against oxidation is now generally admitted to be the most efficacious method. Some years ago telegraph wire used to be boiled in linseed oil, which process cost less than galvanizing and protected the wire tolerably well, except where it was exposed to the action of sea air. It can still be coated in that manner if required; but a good coat of zinc is the best protection against rust, and wire so coated is moreover a better conductor than plain wire.

JOINTS IN TELEGRAPH WIRE.—Above is an illustration of the ordinary "telegraph joint." The fewer the joints in a line the better; hence the advantage of the present method of making single pieces of wire weighing 90 or 100 lbs. (or even 150 lbs.) instead of (as a few years ago) 30 to 50 lbs. All joints should be carefully made and well soldered over, for a bad joint may cause as much resistance to the electric current as several miles of wire.

Wires of Various Metals Compared.

The following table is given by Mr. David Kirkaldy, of London, to exhibit the tensile strength and resistance to tension of wire made of various materials.

Specimens Tested.	Pulling Stress per square inch	
	Hard. Pounds.	Annealed. Pounds.
Copper	63.122	37.002
Brass	81.156	51.550
Charcoal Iron	65.834	46.160
Coke Iron	65.321	61.294
Steel	120.976	74.637
Phosphor Bronze, No. 1	159.515	58.853
" " No. 2	151.119	64.569
" " No. 3	120 141	54.111
" " No. 4	120.900	53.371

Specimens Tested	Extension per cent.		No. twists in 5 inches.
	Annealed.	Hard.	Annealed.
Copper	34.1	86.8	96
Brass	33.5	14.7	57
Charco ' Iron	28.	48.	87
Coke Iron	17.	23.	44
Steel	10.9	*	79
Phosphor Bronze, No. 1	46.6	13.3	66
" " No. 2	42.8	15.8	60
" " No. 3	44.9	17.3	53
" " No. 4	42.4	18.	124

Of the eight pieces of steel tested three stood from 4 to 45 twists, and five stood from 1½ to 4 twists.

Relative Malleability of the Metals.

1. Gold.
2. Silver.
3. Copper.
4. Tin.
5. Platinum.
6. Lead.
7. Zinc.
8. Iron.

Specific Resistances of Metals.

Copper	1.00	Mercury	50.00	Brass Wire	3.88
Silver	.98	Palladium	5.50	German Silver Wire.	11.30
Gold	1.13	Platinum	6.78	Nickel Wire	7.70
Iron	5.63	Tin Wire	6.80	Calcium Wire	2.61
Lead	10.76	Zinc Wire	3.70	Aluminium Wire	1.75

List of Conductors and Non-Conductors,

In which each substance named conducts better than that which precedes it; the first being the best insulator, the last the best conductor

1. Dry Air.
2. Paraffine.
3. Hard Rubber.
4. Shellac.
5. India Rubber.
6. Gutta Percha.
7. Sulphur.
8. Glass.
9. Silk.
10. Dry Paper.
11. Porcelain.
12. Dry Wood.
13. Dry Ice.
14. Water.
15. Saline Solutions.
16. Acids.
17. Charcoal or Coke.
18. Mercury.
19. Lead.
20. Tin.
21. Iron.
22. Platinum.
23. Zinc.
24. Gold.
25. Copper.
26. Silver.

When a wire of small resistance and an insulator of great resistance are employed upon a line the highest excellence is secured, since the lower the resistance in the former the better is the transmission, and the higher the resistance in the latter the less the waste of the current.

TABLE

SHOWING THE DIAMETER IN DECIMALS OF AN INCH, AND THE NUMBER OF FEET IN ONE POUND, OF EACH GAUGE IRON WIRE, AS DRAWN BY WASHBURN & MOEN WIRE GAUGE.

No.	Decimals of inch.	Feet in pound.	No.	Decimals of inch.	Feet in pound.
000	.362	2.873	15	.072	72.984
00	.331	3.444	16	.063	95.396
0	.323	3.619	17	.054	129.873
1	.283	4.698	18	.047	172.401
2	.263	5.444	19	.041	222.222
3	.244	6.333	20	.035	301.249
4	.225	7.460	21	.032	370.036
5	.207	8.809	22	.028	476.190
6	.192	10.270	23	.025	640.74
7	.177	12.047	24	.023	879.03
8	.162	14.365	25	.020	1189.71
9	.148	17.238	26	.018	1485.62
10	.135	20.698	27	.017	1872.71
11	.120	26.174	28	.016	2361.42
12	.105	34.254	29	.015	2978.91
13	.092	44.655	30	.014	3754.83
14	.080	59.174			

TABLE

SHOWING CORRESPONDING SIZES OF STUBS' STEEL WIRE OR RODS, TO THE DIVISIONS OF AN INCH.

Nos. 2	12	21	28	30	35	42	43	52	56	61
$\frac{14}{64}$	$\frac{12}{64}$	$\frac{10}{64}$	$\frac{9}{64}$	$\frac{8}{64}$	$\frac{7}{64}$	$\frac{6}{64}$	$\frac{5}{64}$	$\frac{4}{64}$	$\frac{3}{64}$	$\frac{2}{64}$

MESH OF COAL SCREENS

USED BY THE PRINCIPAL COAL DEALERS.

2½, 2¼ and 2 inch	Screens	Furnace Coal.
1⅝ and 1½ "	"	Stove out of Egg Coal.
1¼ and 1 "	"	Nut out of Stove.
¾ and ⅝ "	"	Stove Coal.
½ and ⅜ "	"	Nut "
¼ "	"	Pea "
Y6 "	"	Brickmakers' Dust.

MESH OF FANNING-MILL WIRE CLOTH.

The ordinary widths are 20, 21, 22 and 24 inch, and the Meshes for cleaning Seed are:

For Wheat....4x4 or 5x5
" Corn and Oats....2x2
" Rye....3x3
" Cockle....8x8 or 9x9
" Peas....2x4 or 2x5
" Clover....13x13 or 14x14
" Clover from Sand....20 or 22 Mesh
" Timothy....16x16, 18x18 or 20x20
" Cheat....2x9, 10 or 12, or 3x10, 11 or 12
" Flax....4x13, 4x14 or 4x16

TABLE OF WEIGHTS,

Showing Estimated Number of Pounds of Barbed Wire Required to Fence Space or Distances Mentioned, with, One, Two or Three Strands.

	1 STRAND.	2 STRANDS.	3 STRANDS.
1 Square Acre.....	57.5 lbs.	115 lbs.	172 lbs.
1 Side of a Square Acre.	15¼ "	28⅛ "	42¾ "
1 Square Half-Acre....	40⅛ "	81 "	121⅛ "
1 Square Mile.....	1440 "	2880 "	4320 "
1 Side of 1 Square Mile.	360 "	720 "	1080 "
1 Rod in Length.....	1⅛ "	2¼ "	3⅜ "
100 Rods in Length.....	112½ "	225 "	337½ "
100 Feet in Length.....	7 "	14 "	21 "

When Posts are placed apart.	There are required for each strand of wire, for one mile of fence...			Total cost of 1 mile of fence when posts cost 12½c. each, and wire and staples cost 7¾c. lb. for galvanized.	
FEET	POSTS.	LBS. OF STAPLES	LBS. OF WIRE.	3 STRANDS.	4 STRANDS.
8	660	7⅛	360	$167 90	$196 35
10	528	5¾	360	149 00	180 39
12	440	4¾	360	139 78	168 07
16½	320	3½	360	124 45	152 68
20	264	3	360	117 40	145 53
25	212	2¼	360	110 74	138 80
30	176	2	360	106 16	134 22
33	160	1¾	360	104 09	132 15

Number of Wires and Distances Between Posts.

Although fences are sometimes made of *two* wires, to fence against cattle only, experts recommend no less than *three*, and as many more as desirable. *Five* wires make a good fence—such is used by nearly all the railroad companies.

The following are the distances apart at which the wires are generally placed:

Two-wire fence, 1st wire 22 inches, 2d wire 44 inches from the ground.

Three-wire fence, 1st wire 16 inches, 2d wire 30 inches, 3d wire 48 inches from the ground.

Four-wire fence, 1st wire 12 inches, 2d wire 24 inches, 3d wire 36 inches, 4th wire 48 inches from the ground.

Five-wire fence, 1st wire 8 inches, 2d wire 15 inches, 3d wire 24 inches, 4th wire 36 inches, 5th wire 48 inches from the ground.

One less strand may be used with *four-point* than two-point wire.

The HEIGHT OF THE LEGAL FENCE varies as follows:

Four feet high in Maine, New Hampshire, Massachusetts, Delaware and Idaho.

Four and a half feet high in Vermont, Rhode Island, Connecticut, New York, New Jersey, Maryland, West Virginia, Ohio, Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Tennessee, Kansas, Nebraska, Colorado, Oregon, Arizona, Nevada, Montana, Dakota and Utah.

Five feet in Pennsylvania, Virginia, Missouri, Kentucky, North Carolina, South Carolina, Georgia, Alabama, Florida, Mississippi, Texas, Arkansas, California, and Washington and Wyoming Territories.

EXTRAS ON CUT NAILS.

SCHEDULE OF PRICES,

Adopted June 6th, 1888.

12d, 16d, 20d, 30d, 40d,	BASE SIZES...	$					per keg
10d	COMMON NAILS.	$	.10	per	keg	above	Base
8d, 9d, 50d, 60d	"	"	.25	"	"	"	"
6d and 7d	"	"	.40	"	"	"	"
4d and 5d	"	"	.60	"	"	"	"
3d COMMON and 4d FINE	.....		1.00	"	"	"	"
3d FINE, 2d COMMON, 1-inch ROOFING	.....		1.50	"	"	"	"
2d FINE	.....		2.00	"	"	"	"
SPIKES, all sizes	.....		.25	"	"	"	"
1¾ and 1½-in. BARREL NAILS.			.60	"	"	"	"
1¾ and 1¼-in.	"	"	1.00	"	"	"	"
1-in.	"	"	1.50	"	"	"	"
⅞-in.	"	"	1.75	"	"	"	"
¾-in.	"	"	2.25	"	"	"	"

Fence and Sheathing Nails same price as Common.

CASING, FLOORING, BOX, WAREHOUSE, COOPER'S AND TOBACCO NAILS .....50c. } per keg above same size Common Nails

SLATING NAILS.....25c. " " "

FINISHING AND CLINCH NAILS.75c. " " "

FINE FINISHING.....90c. " " "

Each Half-Keg 10 cents extra.

LENGTH OF NAILS.

2.	3.	4.	5.	6.	7.	8.	9.	10.	12.	16	20.	30.	40.	50.	60.
1.	1¼.	1½.	1¾.	2.	2¼.	2½.	2¾.	3.	3¼.	3½.	4.	4½.	5.	5½.	6.

STEEL WIRE NAILS (in Kegs.)

STANDARD PRICE-LIST.

12d to 40d common, base price. For others add to base price as follows:

Common Fence, Shingle, Flooring and Common Brads.

12d to 40d	base.
50d and 60d	$ 35
10d	15
8d and 9d	35
6d and 7d	70
4d and 5d	1 00
3d	2 00
2d	2 75

BARBED Common and BARBED Car Nails.

25c. advance over common.

Casing. Smooth Box.

12d to 40d	75
10d	1 00
8d and 9d	1 25
6d and 7d	1 50
4d and 5d	1 75
3d	2 50
2d	3 25
Barbed Box	25c. advance

Fine Nails.

2d	3 50
3d	3 00
4d	2 00

Smooth Finishing Nails.

2d	$3 50
3d	2 70
4d and 5d	2 00
6d and 7d	1 75
8d and 9d	1 50
10d	1 25
12d to 20d	1 00

Barbed Finishing, 25c. advance.

Lining Nails.

¾ in.	4 50
⅞ in.	4 00
1 in.	3 50

Barrel.

¾ in.	3 50
⅞ in.	3 00
1 in.	2 50
1⅛ in.	2 00
1¼ in.	1 75
1⅜ in.	1 25
1½ in.	1 00

Slating.

2d	2 50
3d	1 75
4d	1 25
5d	1 00

Wire Spikes.

All Sizes	35

Tobacco.

4d and 5d	$1 25
6d and 7d	1 00
8d and 9d	75
10d	50

Barbed Roofing.

¾ in.	3 50
⅞ in.	3 00
1 in.	2 50
1¼ in.	2 00
1½ in.	1 50
1¾ in.	1 25
2 in.	1 00

Clinch.

2d	3 50
3d	2 50
4d and 5d	1 75
6d and 7d	1 25
8d and 9d	1 00
10d	90
12d to 20d	75

Hinge Nails.

4d	1 75
6d	1 50
8d	1 00
10d to 20d	75

Adopted at the Cleveland Meeting, June 15, 1888.

LENGTH AND GAUGES OF STANDARD STEEL WIRE NAILS.

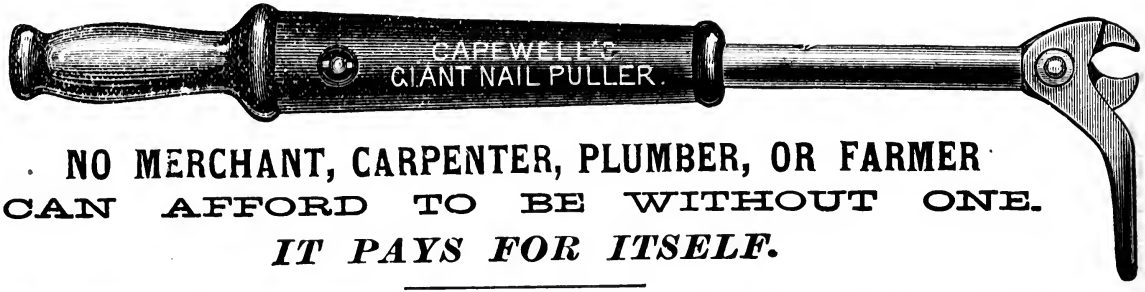
Sizes.	Length, inch.	Common.	Barbed Common.	Clinch.	Fence.	Common Brads.	Smooth & Barbed Flinishing.	Fine.	Barrel.	Casing.	Smooth Box.	Barbed Box.	Flooring Brads.	Barb. Car L'ht	Barb. Car H'y	Slating.	Barbed Roofing.	Shingle.	Tobacco.	Lining.	Spikes.
.....	$\frac{3}{4}$	.....	.....	.....	.....	.....	.....	.....	16	.....	.....	.....	.....	.....	.....	.....	13	.....	.....	17	.....
.....	$\frac{7}{8}$	.....	.....	.....	.....	.....	.....	.....	15	.....	.....	.....	.....	.....	.....	.....	12	.....	.....	17	.....
2d	1	16	15	14	.....	16	17	17	15	16½	16½	16½	.....	.....	.....	12	12	.....	.....	17	.....
3 1/2d	1¼	.....	.....	.....	.....	.....	.....	16½	15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3d	1¼	15½	14	13	.....	15½	16½	.....	14	16	16	16	.....	.....	.....	11	11	.....	.....	.....	.....
.....	1⅜	.....	.....	.....	.....	.....	.....	.....	13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4d	1½	13½	13	12½	.....	13½	16	16	13	15	15	15	.....	12	10	11	10	.....	12	.....	.....
5d	1¾	13	12	12½	10	13	15½	...	.....	14	14	14	.....	10	9	10	10	12½	12	.....	.....
6d	2	12½	12	11	10	12½	14	.....	.....	13½	13½	13½	11	10	9	.....	9	12	11	.....	.....
7d	2¼	12	11	11	9	12	13½	.....	.....	13	13	13	11	9	8	.....	.....	11½	11	.....	.....
8d	2½	11½	11	10	9	11½	12½	.....	.....	12½	12½	12½	10	9	8	.....	.....	11	10	.....	.....
9d	2¾	11	10	10	8	11	12½	.....	.....	12	12	12	10	8	7	.....	.....	11	10	.....	.....
10d	3	10½	9	10	7	10½	12	.....	.....	11½	11½	11½	9	8	7	.....	.....	10	9	.....	7
12d	3¼	9½	8	9	6	9½	11	.....	.....	11	11	11	8	7	6	.....	.....	.....	.....	.....	.....
16d	3½	8½	7	9	5	8½	10½	.....	.....	10	10	10	7	7	6	.....	.....	.....	.....	.....	6
20d	4	6¾	6	8	4	6¾	10½	.....	.....	9½	9½	9½	.....	6	5	.....	.....	.....	.....	.....	5
30d	4½	6	5	.....	.....	6	.....	.....	.....	9	9	9	.....	6	5	.....	.....	.....	.....	Spikes.	4
40d	5	4½	4	.....	.....	4½	.....	.....	.....	8	8	8	.....	5	4	.....	.....	.....	.....	6½ 1	3
50d	5½	3½	.....	.....	.....	3½	.....	.....	.....	.....	.....	.....	.....	4	3	.....	.....	.....	.....	7 0	2
60d	6	3	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	4	3	.....	.....	.....	.....	8 00	1
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9 00	.....

AWARDED A DIPLOMA BY THE AMERICAN INSTITUTE, NEW YORK.

AWARDED A BRONZE MEDAL BY THE SYDNEY EXPOSITION, AUSTRALIA.

IT SAVES MONEY, TIME, LABOR AND NAILS.

THE GIANT NAIL-PULLER AND BOX-OPENER.



NO MERCHANT, CARPENTER, PLUMBER, OR FARMER
CAN AFFORD TO BE WITHOUT ONE.
IT PAYS FOR ITSELF.

ASK ANY ONE OF THE THOUSANDS WHO USE THEM.

MANUFACTURED BY
MALTBY, HENLY & CO.

FOR SALE BY
ALL HARDWARE DEALERS

STANDARD STEEL WIRE NAILS.

SIZES, LENGTH AND NUMBER TO THE POUND.

SIZES.	Length.	Common.	Barbed Common.	Clinch.	Fence.	Finishing	Barbed Finishing	Fine.	Barrel.	Casing.	Smooth Box.	Barbed Box.	Flooring Brads.	Barbed Oval-Head Car Nail. Light.	Barbed Oval-Head Car Nail. Heavy.	Slating.	Barbed Roofing.	Shingle.	Tobacco.	Lining.	Wire Spikes.	Length.	SIZES.
	¾ in	....	....	....	....	....	....	....	1500	....	....	....	....	.....	.....	....	714	....	....	2100	....	¾ in	
	⅞ "	....	....	....	....	....	....	....	1000	....	....	....	....	.....	.....	....	469	....	....	1780	....	⅞ "	
2d.....	1 "	1200	876	710	....	1658	1558	1550	875	1350	1350	1143	....	.....	.....	411	411	....	....	1500	....	1 "	2d
3d Fine	1⅛ "	....	....	....	....	....	....	1140	775	....	....	....	....	.....	.....	....	....	....	....	....	....	1⅛ "	3d Fine
3d Com	1¼ "	720	568	429	....	980	913	....	560	913	913	885	....	.....	.....	329	251	....	....	....	....	1¼ "	3d Com.
	1⅜ "	....	....	....	....	....	....	....	390	....	....	....	....	.....	.....	....	....	....	....	....	....	1⅜ "	
4d.....	1½ "	432	357	274	....	760	584	760	350	584	584	530	....	274	165	209	165	....	274	....	....	1½ "	.....4d
5d.....	1¾ "	300	235	235	142	575	410	....	....	410	410	406	....	142	118	142	142	270	235	....	....	1¾ "	.....5d
6d.....	2 "	252	204	157	124	350	268	....	....	310	310	299	157	124	103	....	103	204	157	....	....	2 "	.....6d
7d.....	2¼ "	186	139	139	92	275	238	....	....	238	238	210	139	92	76	....	....	182	139	....	....	2¼ "	.....7d
8d.....	2½ "	132	99	99	82	190	164	....	....	170	170	170	99	82	69	....	....	125	99	....	....	2½ "	.....8d
9d.....	2¾ "	105	90	90	62	173	149	....	....	150	150	147	90	62	54	....	....	114	90	....	....	2¾ "	.....9d
10d.....	3 "	87	69	83	50	137	105	....	....	121	121	121	69	57	50	....	....	83	69	....	50	3 "	.....10d
12d.....	3¼ "	66	53	64	38	98	97	....	....	97	97	94	53	47	38	....	....	....	....	....	....	3¼ "	.....12d
16d.....	3½ "	51	43	59	30	81	71	....	....	72	72	72	43	43	35	....	....	....	....	....	35	3½ "	.....16d
20d.....	4 "	35	31	43	23	71	54	....	....	54	54	53	....	31	26	....	....	....	....	....	26	4 "	.....20d
30d.....	4½ "	27	24	....	....	....	....	....	....	46	46	44	....	28	24	....	....	....	....	....	20	4½ "	.....30d
40d.....	5 "	21	18	....	....	....	....	....	....	36	36	36	....	21	18	....	....	....	....	....	15	5 "	.....40d
50d.....	5½ "	15	....	....	....	....	....	....	....	....	....	....	....	17	14	....	....	....	....	....	12	5½ "	.....50d
60d.....	6 "	12	....	....	....	....	....	....	....	....	....	....	....	15	13	....	....	....	....	....	10	6 "	.....60d
	6½ "																				9	6½ "	
	7 "																				7	7 "	
	8 "																				5	8 "	
	9 "																				4½	9 "	

3⅜ lbs. of 4d Common, or 2⅜ lbs. of 3d Common, will lay 1000 shingles.

3¾ lbs. of 3d Fine will put on 1000 laths, 4 nails to the lath.

APPROXIMATE NUMBER OF WIRE NAILS PER POUND.

WIRE GAUGE.	DIAM. W. & M.	APPROXIMATE SIZE.	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/2	4	4 1/2	5	6	7	8
	Inches.	*Inches.*																										
00	.331	11/32 scant.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	33	27	23	20	18	16	15	14	12	10	9	8	7	6	5
0	.307	5/16 full.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	34	29	25	21	19	17	16	15	13	11	10	9	8	7	5½
1	.283	9/32 scant.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	.263	1/4 full.	.....	.....	.....	.....	.....	.....	.....	.....	.....	57	50	45	38	32	28	25	23	21	19	16	14	13	11	10	8	7
3	.244	1/4 scant.	.....	.....	.....	.....	.....	.....	.....	.....	.....	65	58	52	44	37	32	29	26	24	22	19	16	14	13	11	9	8
4	.225	7/32 full.	.....	.....	.....	.....	.....	.....	.....	.....	100	87	76	67	60	50	43	38	34	30	28	25	22	19	17	15	13	10
5	.207	3/16	.....	.....	.....	.....	.....	.....	.....	.....	120	103	90	80	72	60	51	45	40	36	33	30	26	23	20	18	15	13	11
6	.192	3/16 full.	.....	.....	.....	.....	.....	211	169	141	121	106	94	85	71	60	53	47	42	39	35	30	26	24	21	18	15	..
7	.177	3/16	.....	.....	.....	.....	.....	247	197	164	141	123	111	99	82	71	62	55	50	45	41	35	31	28	25	21	18	..
8	.162	5/32 full.	.....	.....	.....	.....	.....	299	239	200	171	149	133	120	100	85	75	67	60	54	50	43	37	33	30	25	..	..
9	.148	1/7	.....	.....	.....	.....	.....	345	275	229	197	172	153	137	115	98	86	76	69	62	57	49	43	39	35	29	..	..
10	.135	1/8 full.	.....	.....	.....	.....	.....	414	331	276	236	207	184	165	138	118	103	92	82	75	69	59	52	46	41	..	..	..
11	.120	1/8 scant.	.....	.....	663	496	397	333	283	248	220	198	165	142	124	110	99	90	83	71	62	55	50	..	..	..	..	..
12	.105	1/10	.....	.....	837	628	502	418	359	314	279	251	209	179	157	139	125	114	105	90	79	70	..	..	..	..	..	..
13	.092	3/32	.....	.....	1.096	822	658	548	469	411	365	329	274	235	205	182	164	149	137	117	103	..	..	..	..	..	..	..
14	.080	1/12	.....	.....	1.429	1.072	857	714	613	536	476	429	357	306	268	238	214	195	178	153	..	..	..	..	..	..	..	..
15	.072	1/14	.....	2.840	1.893	1.420	1.136	947	811	710	631	568	473	406	350	315	284	258	236	..	..	..	..	..	..	..	..	..
16	.063	1/16	.....	3.504	2.336	1.752	1.402	1.168	1.001	876	778	701	584	500	438	389	350	..	..	..	..	..	..	..	..	..	..	..
17	.054	.....	.....	4.571	3.048	2.282	1.828	1.523	1 305	1.143	1.015	913	761	653	571	508	..	..	..	..	..	..	..	..	..	..	..	..
18	.047	.....	.....	6.233	4.156	3.116	2.495	2.077	1.781	1.558	1.385	1.246	1.038	890	779	..	..	..	..	..	..	..	..	..	..	..	..	..
19	.041	.....	.....	8.276	5.517	4.138	3.310	2.758	2.364	2.069	1.839	1.655	1.379	1.182	..	..	..	..	..	..	..	..	..	..	..	..	..	..
20	.035	1/32 full.	.....	10.668	7.612	5.334	4.267	3.556	2.933	2.667	2.370	2.133	1.778	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
21			26.000	15.000	10.000	7.500	6.000	5.000	4.400	2.750	3.333	3.000	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
22			23.702	17.777	11.850	8.888	7.111	5.926	5.079	4.444	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
			30.476	22.856	15.227	11 428	9.143	7.618	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

This Table is an *Average* only, and the figures given may be varied slightly either way, by changes in the dimensions of the heads or points.

SEE PAGE 100.

Table of Iron, Steel, Copper and Brass Wire.

WEIGHT OF 100 FEET IN POUNDS. BIRMINGHAM WIRE GAUGE.

Brass and Copper Wire from 0 to 25 is numbered by Stubs' Gauge. Fine Wire from No. 26 is numbered by London Gauge.

No. of Gauge.	PER LINEAL FOOT.			
	Iron.	Steel.	Copper.	Brass.
0000	54 62	55 13	62 39	58 93
000	47 86	48 32	54 67	51 64
00	38 27	38 63	43 71	41 28
0	30 63	30 92	34 99	33 05
1	23 85	24 07	27 24	25 73
2	21 37	21 57	24 41	23 06
3	17 78	17 94	20 3	19 18
4	15 01	15 15	17 15	16 19
5	12 82	12 95	14 65	13 84
6	10 92	11 02	12 47	11 78
7	8 586	8 667	9 807	9 263
8	7 214	7 283	8 241	7 783
9	5 805	5 859	6 63	6 262
10	4 758	4 803	5 435	5 133
11	3 816	3 852	4 359	4 117
12	3 148	3 178	3 596	3 397
13	2 392	2 414	2 723	2 58
14	1 826	1 843	2 085	1 969
15	1 374	1 387	1 569	1 482
16	1 119	1 13	1 279	1 208
17	8915	9	1 018	9618
18	6363	6423	7168	6864
19	4675	472	534	5043
20	3246	3277	3709	3502
21	2714	274	31	2929
22	2079	2098	2373	2241
23	1656	1672	1892	1788
24	1283	1295	1465	1384
25	106	107	1211	1144
26	0859	0867	0981	0926
27	0678	0685	0775	0732
28	0519	0524	0593	056
29	0448	0452	0511	0483
30	0382	0385	0436	0412
31	0265	0267	0303	0286
32	0215	0217	0245	0231
33	017	0171	0194	0183
34	013	0131	0148	014
35	0066	0067	0076	0071
36	0042	0042	0048	0046

—THE—

TRENTON IRON COMPANY,

(INCORPORATED 1847.)

MANUFACTURERS OF

IRON AND STEEL WIRE

OF ALL KINDS.

WIRE ROPE

Rolled Rods of Refined Iron and Steel,

STEEL WIRE BALE TIES.

WORKS AND OFFICE:

AT TRENTON, NEW JERSEY.

NEW YORK OFFICE:

COOPER, HEWITT & CO.,

17 BURLING SLIP.

Philadelphia Office: 22 North Fourth Street.

Wire Standard Hoisting Ropes,

With 6 Strands of 19 Wires Each.

TRADE NUMBERS, SIZES, WEIGHT AND STRENGTH.

IRON.

Trade No.	Diameter in Inches.	Circumference in Inches.	Estimated Weight per Foot in Lbs.	Breaking Stress in Tons of 2000 Lbs.	Proper Work'g Load in Tons of 2000 Lbs.	Circumf'ence of Hemp Rope of equal strength.	Minim'm diameter of Drum or Sheave, in Ft.
1	2¼	7	7.75	74	15	15½	8
2	2	6¼	6.11	65	13	14½	7
3	1¾	5½	5.09	54	11	13	6½
4	1⅝	5	4.00	44	9	12	5
5	1½	4¾	3.55	39	8	11½	4¾
5½	1⅜	4¼	2.90	33	6½	10¼	4½
6	1¼	4	2.42	27	5½	9½	4
7	1⅛	3½	1.95	20	4	8	3½
8	1	3¼	1.53	16	3	7	3
9	⅞	2¾	1.16	11.50	2½	6	2¾
10	¾	2⅜	0.85	8.64	1¾	5	2½
10¼	⅝	2	0.60	5.13	1¼	4½	2
10½	9/16	1¾	0.47	4.27	¾	4	1¾
10¾	½	1½	0.37	3.48	½	3½	1½
10⅞	7/16	1¼	0.26	2.50	¼	3	1

CRUCIBLE STEEL.

1	2¼	7	7.75	164.69	32.90		9
2	2	6¼	6.11	132.37	26.50		8
3	1¾	5½	5.09	108.13	21.63		7½
4	1⅝	5	4.00	97.17	19.44		6
5	1½	4¾	3.55	86.38	17.30	16½	5½
5½	1⅜	4¼	2.90	72.33	14.46	14	5¼
6	1¼	4	2.42	50.17	10.00	12¼	5
7	1⅛	3½	1.95	38.00	7.70	11	4½
8	1	3¼	1.53	29.20	5.80	9	4
9	⅞	2¾	1.16	21.55	4.00	8	3¾
10	¾	2⅜	0.85	14.99	3.00	6½	3½
10¼	⅝	2	0.60	12.53	2.50	5¾	3
10½	9/16	1¾	0.47	8.81	1.75	5¼	2¾
10¾	½	1½	0.37	7.52	1.50	4¾	2

☞ The weights above stated are for Ropes with HEMP CENTERS. For Ropes made with WIRE CENTERS, add TEN PER CENT. to these weights. Also, see Table of GALVANIZED STRAND.

Spring Cotters and Keys and their Applications

SPRING COTTERS.

No.	30	31	32	33	34	35	36	37	38	39
Wire Gauge...	13	13	11	11	7	7	4	4	1	1
For Hole.....	$\frac{3}{32}$	$\frac{3}{32}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{5}{16}$
For Nuts.....	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{7}{8}$	1	1	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{2}$

SPRING KEYS.

No.....	000	00	0	1	$1\frac{1}{2}$	2	3	4
Wire Gauge.....	12	12	12	11	11	10	10	10
For Hole.....	$\frac{7}{32}$	$\frac{7}{32}$	$\frac{7}{32}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{9}{32}$	$\frac{9}{32}$	$\frac{9}{32}$
For Bolts.....	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	1

Wire Bale Ties.

Nos. 16, 15, 14, 13 and 12 are put up in bundles of 250 Ties, Nos. 11, 10 and 9 wire are put up in bundles of 125 Ties and run in length from 6 feet to $11\frac{1}{4}$ feet.

Other Sizes and Lengths made to order as required.

To get length of Tie required, add three inches to the measure around the bale when under pressure.

SIZE AND LENGTH OF TIES IN GENERAL USE.

For 17×22 Perpetual Presses, use Ties 8, $8\frac{1}{2}$ or 9 feet long; No. 14 wire for heavy work, and No. 15 for light work.

For 14×18 Perpetual Presses, use Ties 8, $8\frac{1}{2}$ or $8\frac{1}{2}$ feet long; No. 14 wire for extra or extreme heavy work; No. 15 for heavy and medium work, and No. 16 for light work.

For 12×15 Perpetual Presses, use Ties $7\frac{1}{2}$, $7\frac{3}{4}$ or 8 feet long; No. 15 wire for heavy work, and No. 16 for medium or light work.

For Upright Hand Presses, use No. 14 or No. 15 wire.

For Upright Light Horse Presses, use No. 14 wire.

For Upright Heavy Portable or Light Stationary Horse Presses, use No. 13 wire.

For Upright Heavy Stationary and Beater Presses, use No. 12, No. 11 and No. 10 wire, according to the size of bale and number of Ties used.

For Broom Corn, Wool, Cotton, Hides, etc., or other materials put up in heavy bales, use No. 9, No. 10 or No. 11 wire.

ROUND OR OVAL-HEAD IRON RIVETS.

Number of Rivets in One Pound.

APPROXIMATE.

Size.	3/8	0	5/16	1	2	3	1/4	4	5	6	3/16	7	8	9
3/8	...	...	...	...	...	...	...	...	.....	154	188	221	256	334
1/3	32	42	51	57	65	75	80	89	108	131	159	185	215	278
5/16	29	37	45	50	57	67	70	78	94	114	138	158	185	238
3/8	26	33	41	45	51	59	63	70	84	101	122	139	163	208
7/16	24	30	37	41	46	54	57	63	75	91	109	123	145	185
1	22	28	34	37	42	49	52	57	68	82	98	111	131	166
1 1/16	20	26	31	34	39	45	47	53	63	75	90	101	119	151
1 1/8	19	24	29	32	36	42	44	49	58	69	83	93	109	138
1 3/16	18	22	27	29	33	39	41	45	54	54	76	86	101	127
1 1/4	17	21	25	28	31	37	38	42	51	59	71	80	94	119
1 5/16	15	18	22	24	27	33	34	40	44	55	63	70	82	104
2	13	17	20	22	25	29	30	35	40	47	56	62	73	92
2 1/4	12	15	18	19	22	27	28	32	36	42	50	56	66	83
2 1/2	11	14	17	18	20	24	25	29	33	39	46	50	60	75
2 3/4	10	13	15	17	19	22	23	26	30	36	42	46	55	67
3	9	12	14	15	17	21	22	24	28	33	39	43	51	64
3 1/4	8 1/2	11	13	14	16	19	20	23	26	31	36	40	47	59
3 1/2	8	10 1/2	12	13 1/2	15	18	19	21	24	29	34	38	44	55
3 3/4	7 1/2	9 3/4	11 3/4	12 3/4	14	17	18	20	23	27	32	35	41	52
4	7 1/4	9 1/4	11	12	13	16	17	18	21	25	30	33	38	49
4 1/4	7	8 3/4	10 1/2	11 1/4	12 3/4	15	16	17	20	24				
4 1/2	6 1/2	8 1/4	10	10 3/4	12	14	15	16	19	23				
4 3/4	6 1/4	8	9 1/4	10	11 1/2	13 3/4	14 3/4	15 3/4	18	22				
5	6	7 1/2	9	9 3/4	11	13	14	15	17	21				
5 1/4	5 3/4	7 1/4	8 1/2	9 1/4	10 1/2	12 1/2	13 1/2	14 1/2	16 1/2	20				
5 1/2	5 1/2	7	8 1/4	9	10	12	13	14	16	19				
5 3/4	5 1/4	6 3/4	7 3/4	8 1/2	9 1/2	11 1/2	12 1/2	13 1/2	15	18				
6	5	6 1/2	7 1/2	8 1/4	9 1/4	11	12	13	14	17				

SHRINKAGE OF CASTINGS.

In making allowance for shrinkage in casting, pattern-makers understand that different shapes will shrink differently. The standard table of allowance for shrinkage in use in the best shops of the country is as follows:

For Loam Castings..... 1/12 inch per foot.
" Green Sand Castings..... 1/10 inch per foot.
" Dry Sand Castings..... 1/10 inch per foot.
" Brass Castings..... 3/16 inch per foot.
" Copper Castings..... 3/16 inch per foot.
" Bismuth Castings..... 5/32 inch per foot.
" Tin Castings..... 1/8 inch per foot.
" Zinc Castings..... 5/16 inch per foot.
" Lead Castings..... 5/16 inch per foot.

BRUCE & COOK.

IMPORTERS OF

METALS

TIN PLATE.
Roofing Plate,
Special Sizes,
Block and Bar Tin,
Tinners' Solder.

SHEET IRON.
Russia,
Pat. Planished,
Galvanized,
Double Seaming,
Cold Rolled,
Common.

WIRE.
Bright Iron,
Annealed Fence,
Coppered,
Galvanized,
Tinned.

SOLDER.
Ex. Wiping,
No. 1 Refined,
No. 1 Capping,
Ex. No. 1 "B. & C."
Half and Half.

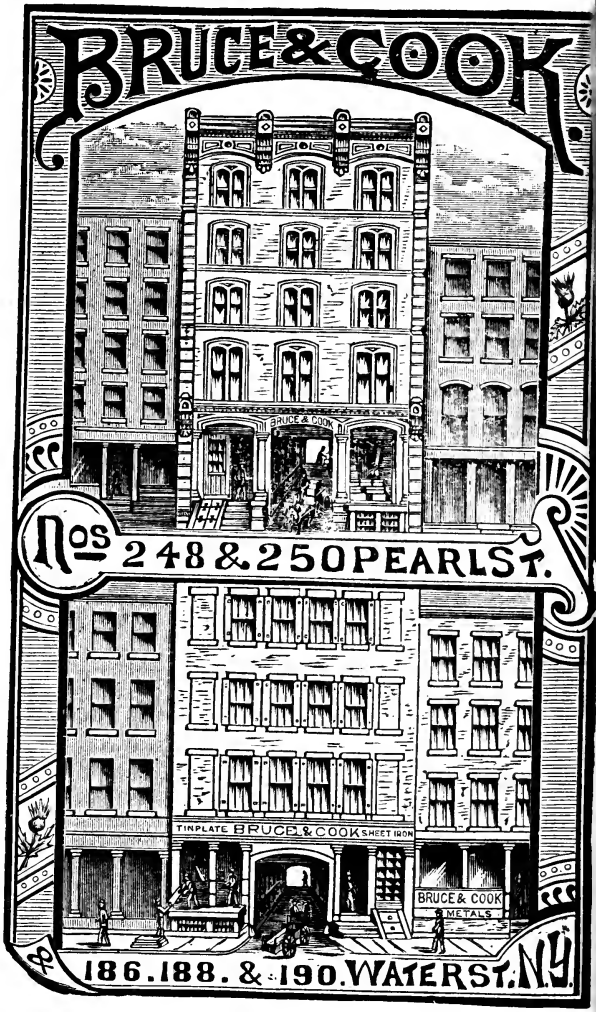
COPPER.
Sheet, Bottoms,
Solders, Bolts,
Wire, Ingot.

SHEET ZINC.
American,
Spelter.

ELBOWS.
Russia,
Planished,
Charcoal.

STOVE BOARDS.
Stove Bolts,
Stovepipe Collars,
Stovepipe Dampers,
Fire Pots,
Rivets, Black,
Rivets, Tinned,
Kettle Ears.

SUNDRIES.
Babbit Metal,
Antimony,
Spelter Solder.
Tinsmiths' Tools
and Machines,
Milk Can Trimmings.



Austin's Patent Expanding Conductor and Spiral-Ribbed Pipe.

PATENT ROOFING SEAMER FOR PUTTING TIN TOGETHER.

ALL LATEST AND BEST MACHINES FOR ROOFERS AND TINNERS.

Eight-foot Seamless Eave Troughs and Gutters, I. XL Ventilators.

Table of Standard or Regular Tin Plates.

Size and Kind of Plates—Number and Weight of Sheets in a Box, and Wire Gauge Thickness, of every Kind and Size.

Size.	Grade.	Sheets in Box.	Pounds in Box.	Wire Gauge.
10 by 10	IC	225	78	29
"	IX	225	98	27
"	IXX	225	112	26
"	IXXX	225	124	25
"	IXXXX	225	140	24½
10 by 14	IC	225	108	29
"	IX	225	136	27
"	IXX	225	159	26
"	IXXX	225	178	25
"	IXXXX	225	200	24½
10 by 20	IC	225	156	29
"	IX	225	196	27
11 by 11	IC	225	95	29
"	IX	225	118	27
"	IXX	225	135	26
11 by 15	SDC	200	164	26
"	SDX	200	185	25
"	SDXX	200	206	24½
"	SDXXX	200	226	24
"	SDXXXX	200	248	23
22 by 15	SDC	100	164	26
"	SDX	100	185	25
"	SDXX	100	206	24½
"	SDXXX	100	226	24
"	SDXXXX	100	248	23
12½ by 17	DC	100	96	28
"	DX	100	124	26
"	DXX	100	145	24
"	DXXX	100	166	23
"	DXXXX	100	185	22
15 by 21	DX	100	183	27
"	DXX	100	214	24
"	DXXX	100	245	23
"	DXXXX	100	276	22
25 by 17	DC	50	96	28
"	DX	50	124	26
"	DXX	50	145	24
"	DXXX	50	166	23
"	DXXXX	50	185	22
14 by 20	IC	112	108	29
"	IX	112	136	27
"	IXX	112	157	26
"	IXXX	112	178	25
"	IXXXX	112	200	24½
"	IXXXXXX	112	240	23½
12 by 12	IC	225	108	29
"	IX	225	136	27
"	IXX	225	157	26
"	IXXX	225	178	25

Size.	Grade.	Sheets in box.	Pounds in box.	Wire Gauge.
13 by 13	IC	225	130	29
"	IX	225	164	27
"	IXX	225	190	26
"	IXXX	225	216	25
14 by 14	IC	225	152	29
"	IX	225	192	27
"	IXX	225	221	26
"	IXXX	225	250	25
"	IXXXX	225	279	24½
15 by 15	IX	225	221	27
"	IXX	225	255	26
"	IXXX	225	288	25
"	IXXXX	225	322	24½
16 by 16	IC	225	200	29
"	IX	225	252	27
"	IXX	225	290	26
"	IXXX	225	328	25
"	IXXXX	225	368	24½
17 by 17	IX	112	140	27
"	IXX	112	162	26
"	IXXX	112	184	25
"	IXXXX	112	205	24½
18 by 18	IX	112	158	27
"	IXX	112	182	26
"	IXXX	112	206	25
"	IXXXX	112	231	24½
22 by 22	IXX	56	135	26
"	IXXX	56	...	25
"	IXXXX	56	...	24½
24 by 24	IXX	56	157	26
"	IXXX	56	...	25
"	IXXXX	56	...	24½
Terne Plates.				
14 by 20	IC	112	108	29
"	IX	112	136	27
20 by 28	IC	112	216	29
"	IX	112	272	27
20 by 200	IC	....	172	29
"	IX	....	216	27
Tin Taggers.				
10 by 14		450	108	38
Black Taggers.				
10 by 14		256	108	32
"		360	108	34
"		360	108	36
"		450	108	38

From the "Metal Worker."

Cost of Tin Roofing.

The following table shows the cost per square and per square foot of tin roofing, laid with 14x20 tin, with tin at any price from $4 to $10 per box. The first column contains the price per box of tin; the second column shows the cost of tin per square (100 square feet) of surface, and the third column shows the cost of tin per square foot of surface:

FLAT SEAM ROOFING—COST WITH 14x20 TIN.

Price of tin per box.	Cost per square of flat roof 14x20 tin.	Cost per sq. foot.	Price of tin per box.	Cost per square of flat roof 14x20 tin.	Cost per sq. foot.
$4.25	$2.21	.0221	$8.25	$4.29	.0429
4.50	2.34	.0234	8.50	4.42	.0442
4.75	2.47	.0247	8.75	4.55	.0455
5.00	2.60.	.0260	9.00	4.68	.0468
5.25	2.73	.0273	9.25	4.81	.0481
5.50	2.86	.0286	9.50	4.94	.0494
5.75	2.99	.0299	9.75	5.07	.0507
6.00	3.12	.0312	10.00	5.20	.0520
6.25	3.25	.0325	10.25	5.33	.0533
6.50	3.38	.0338	10.50	5.46	.0546
6.75	3.51	.0351	10.75	5.59	.0559
7.00	3.64	.0364	11.00	5.72	.0572
7.25	3.77	.0377	11.25	5.85	.0585
7.50	3.90	.0390	11.50	5.98	.0598
7.75	4.03	.0403	11.75	6.11	.0611
8.00	4.16	.0416	12 00	6.24	.0624

STANDING SEAM ROOFING—COST WITH 14x20 TIN.

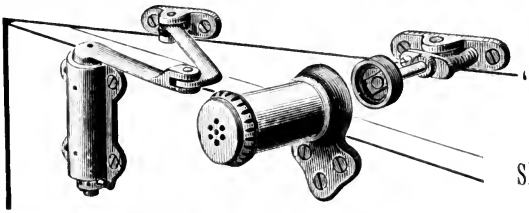
Price of tin per box.	Cost per square of standing seam roof with 14x20 tin.	Cost per sq. foot.	Price of tin per box.	Cost per square of standing seam roof with 14x20 tin.	Cost per sq. foot.
$4.25	$2.37	.0237	$7.25	$4.03	.0403
4.50	2.51	.0251	7.50	4.17	.0417
4.75	2.65	.0265	7.75	4.31	.0431
5 00	2.79	.0279	8.00	4.45	.0445
5.25	2.93	.0293	8.25	4.59	.0459
5.50	3.06	.0306	8.50	4.73	.0473
5.75	3.20.	.0320	8.75	4.87	.0487
6.00	3.34	.0334	9.00	5.01	.0501
6.25	3.48.	.0348	9.25	5.15	.0515
6.50	3.62	.0362	9.50	5.29	.0529
6.75	3.76	.0376	9.75	5.43	.0543
7.00	3.90	.0390	10.00	5.57	.0557

The SARGENT-SPRAGUE CAN OPENER is unequalled for opening tin cans of **ANY SHAPE OR SIZE.** The **DOUBLE FOOT** gives it a bearing on both sides of the knife, thus bringing the cutting edge in position to make a **CLEAN SHEAR CUT,** without leaving the tin torn or ragged; the double bearing also prevents an unequal strain upon the rivet, and insures durability with **RAPID** and **SATISFACTORY** work. Well made. Requires no adjusting. Always ready for use. **It is the best and most popular.**

DOOR SPRING AND CHECK.

Eclipse Spring. | Eclipse Check.

THIS will "Shut that Door."



THIS will "Stop that Slamming."

THE CUT SHOWS THE ECLIPSE DOOR SPRING AND CHECK APPLIED

USE THE ECLIPSE DOOR SPRING AND CHECK.

The Eclipse Spring and Check are used in the counting room of this paper, and have been found to possess all the advantages claimed for them by the manufacturers. They not only close the door tightly, but do it so quietly that persons of the most nervous temperament are not annoyed. This little invention is especially useful in homes, and when placed on the doors leading from the kitchen it keeps them closed, thus preventing the odor which arises from cooking from permeating the house.

—*New York Journal of Commerce.*

BUY THE ECLIPSE.

THE ECLIPSE DOOR SPRING

Is the best ever offered, because:
The greatest power, exerted when the door is closed, gradually decreases as the door opens.
Tension of spring is adjustable.
Spring is out of sight, and is of extra heavy steel of the best quality, oil tempered.
The parts are interchangeable, so that in case of breakage any part can be replaced.

THE ECLIPSE DOOR CHECK

Prevents doors from slamming.
Can be placed on any door
Allows the door to open wid
The parts are interchangeable, so that in ca of breakage any part can be replaced.

For Sale by all well regulated Hardware Dealers the World over.

Manufactured by SARGENT & CO.

Cost of Tin Roofing—Continued.

The following table shows the cost per square and per square foot of tin roofing, laid with 20x28 tin, with tin at any price from $8 to $24 per box. The first column contains the price per box of tin; the second column shows the cost of tin per square (100 square feet) of surface, and the third column shows the cost of tin per square foot of surface.

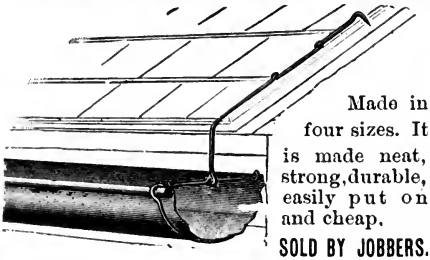
FLAT SEAM ROOFING—COST WITH 20x28 TIN.

Price of tin per box.	Cost per square of flat seam roof 20x28 tin.	Cost per sq. foot.	Price of tin per box.	Cost per square of flat seam roof 20x28 tin.	Cost per sq. foot.
$8.00	$2.01	.0201	$16.00	$4.01	.0401
8.50	2.13	.0213	16.50	4.13	.0413
9.00	2.26	.0226	17.00	4.26	.0426
9.50	2.38	.0238	17.50	4.38	.0438
10.00	2.51	.0251	18.00	4.51	.0451
10.50	2.63	.0263	18.50	4.63	.0463
11.00	2.76	.0276	19.00	4.76	.0476
11.50	2.88	.0288	19.50	4.88	.0488
12.00	3.00	.0300	20.00	5.01	.0501
12.50	3.13	.0313	20.50	5.13	.0513
13.00	3.25	.0325	21.00	5.26	.0526
13.50	3.38	.0338	21.50	5.38	.0538
14.00	3.50	.0350	22.00	5.51	.0551
14.50	3.63	.0363	22.50	5.63	.0563
15.00	3.75	.0375	23.00	5.76	.0576
15.50	3.88	.0388			

STANDING SEAM ROOFING—COST WITH 20x28 TIN.

Price of tin per box.	Cost per square of standing seam roof with 20x28 tin.	Cost per sq. foot.	Price of tin per box.	Cost per square of standing seam roof with 20x28 tin.	Cost per sq. foot.
$8.00	$2.15	.0215	$16.50	$4.42	.0442
8.50	2.28	.0228	17.00	4.56	.0456
9 00	2.41	.0241	17.50	4.69	.0469
9.50	2.55	.0255	18.00	4.82	.0482
10.00	2.68	.0268	18.50	4.96	.0496
10.50	2.82	.0282	19.00	5.09	.0509
11.00	2.95	.0295	19.50	5.23	.0523
11.50	3.09	.0309	20.00	5.36	.0536
12.00	3.21	.0321	20.50	5.49	.0549
12.50	3.35	.0335	21.00	5.63	.0563
13 00	3.48	.0348	21.50	5.76	.0576
13.50	3.62	.0362	22.00	5.90	.0590
14.00	3.75	.0375	22.50	6.03	.0603
14.50	3.89	.0389	23.00	6.17	.0617
15.00	4.02	.0402	23.50	6.30	.0630
15.50	4.15	.0415	24.00	6.43	.0643
16.00	4.29	.0429			

BELL'S GALVANIZED WIRE EAVE TROUGH HANGER.



Made in four sizes. It is made neat, strong, durable, easily put on and cheap.

SOLD BY JOBBERS.

Sample Hanger and Descriptive Circular Free on application.

J. W. BELL & CO., Mercer, Pa.

Sole Manufacturers and Owners of Letters Patent.

CHICAGO OFFICE, 34 WABASH AVE., JAS. J COLLINS, Manager.

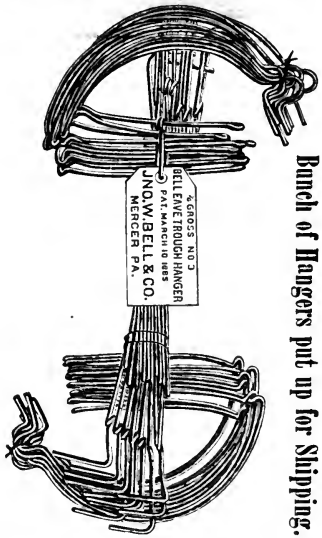
PRICE-LIST.

No. 1—For 4-in. trough (made from 7 in. of tin)..... .....$2 50

No. 2—For $4\frac{7}{8}$-in. trough (made from $8\frac{1}{2}$ in. of tin)..... 3 25

No. 3—For $5\frac{1}{4}$-in. trough (made from $9\frac{1}{4}$ in. of tin)..... 3.50

No. 4—For $5\frac{5}{8}$-in. trough (made from 10 in. of tin)..... 3 75



Bunch of Hangers put up for Shipping.

It is in great favor with Tinners wherever used.

DO NOT FAIL TO TRY IT.

JOHN MAXWELL,

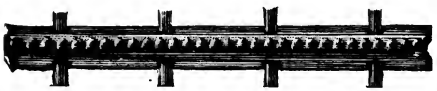
MANUFACTURER OF PATENTED

BRASS,
Bright Tinned Wire
AND
JAPANNED

Bird Cages.

The cheapest and most salable in market. Catalogues and Price-Lists furnished to the trade.

247 and 249 Pearl St., New York



Full Size of Band for Brass and Tinned Wire Cages.

Universal Assistant

—AND—

Complete Mechanic.

Containing a million industrial facts from the Household to the Manufactory.

By R. MOORE.

Illustrated with 500 engravings. 1000 pages bound in cloth.

Price, - $2.50

FOR SALE BY

Henry Hopkins & Co.

BOOKSELLERS & PUBLISHERS,

99 Reade St., N. Y.

RECIPES FOR SOLDERS.

SOFT SOLDERS.

Among the soft solders to be employed with metals melting at a low temperature, we give the following:

Solder for bright tin ware, etc.: "Half & Half."

Tin	50 parts.
Lead	50 "

Solder for roofing, and plumbing joints: "No. 1."

Tin	40 parts.
Lead	60 "

Solder for galvanized ware, etc.: "No. 1. Extra."

Tin	45 parts.
Lead	55 "

Solder for pewter:

Tin	100 parts.
Lead	200 "

Solder for sealing iron in stone:

Lead	200 parts.
Zinc	100 "

This alloy is more resisting and adheres better than pure lead.

Solders for obtaining casts of medals, coins, etc.:

Bismuth	400 or 600
Lead	200 " 200
Tin	200 " 300

This alloy melts between 212 F. (or at water-boiling point) and becomes very liquid.

HARD SOLDERS.

Above we give the alloys of all soft solders. Herewith we give the constituents and process of making the harder ones:

Solder for iron:

Copper	67
Zinc	33

Solder for pure copper or ordinary brass:

Copper	3
Zinc	1

Solder for hard brass:

Scraps of metal to be soldered	4
Zinc	1

Hard solder for small and thin pieces:

Copper	86.5
Zinc	4.5

Solder for uniting brass tube seams:

Copper... 70	}	Brass	77.5
Tin..... 30	}	Zinc	22.5

The proper process of making these solders is as follows: The copper and zinc are melted in separate crucibles, then added together in a pouring-pot and thoroughly mixed, and when at the proper temperature is poured from a certain height upon a bundle of birch twigs, kept wet and agitated at the surface of a tub of water. The solder is thus obtained in the shape of fine grains, having an irregular crystallization. When solder is not sufficiently fine it is hammered in a cast-iron mortar and passed through a sieve.

Table of Weights of Sheet Copper per Square Foot, and Thickness per English Wire Gauge.

English Wire Gauge.	Weight per sq. foot.		Weight of Each Sheet.				
			14x18	24x48	30x60	36x72	48x72
	lbs.	oz.	lbs.	lbs.	lbs.	lbs.	lbs.
No. 1	14	8	.....	116	181	261	348
2	13	14	.....	111	174	250	334
3	12	12	.....	102	159	230	306
4	11	9	.....	93	145	209	278
5	10	1	.....	81	126	182	242
6	9	6	.....	75	118	169	226
7	8	11	.....	70	109	157	209
8	7	14	.....	63	99	142	190
9	7	3	.....	58	90	130	173
10	6	8	.....	48	81	117	156
11	5	12	.....	46	73	104	139
12	5	1	.....	41	64	91	122
13	4	5	.....	35	54	78	104
14	3	9	.....	29	45	65	86
15	3	4	.....	26	41	59	78
16	2	14	.....	23	36	52	70
17	2	8	.....	20	32	45	60
18	2	2	.....	18	27	39	52
19	1	15	.....	16	24	35	47
20	1	12	.....	14	22	32	43
21	1	9	.....	13	20	29	39
22		22	$6\frac{1}{5}$	12	18	26	35
23		20	$5\frac{2}{5}$	10	16	23	31
24		18	$5\frac{1}{5}$	9	15	21	28
25		16	$4\frac{2}{5}$	8	$12\frac{1}{2}$	19	25
26		14	4	7	11	15	21
27		12	$3\frac{1}{5}$	6	$9\frac{3}{5}$	13	18
28		10	3	5	7	11	15

WEIGHT OF SHEET COPPER PER SQUARE FOOT.

$\frac{1}{16}$ inch Thick Weighs	.....	3 lbs	to the square foot.	
$\frac{1}{8}$ " " "	.....	6 "	" " " "	
$\frac{1}{4}$ " " "	.....	12 "	" " " "	
$\frac{1}{2}$ " " "	.....	24 "	" " " "	

Planished Copper—Boiler Size.

Wire Gauge.	Size of Sheet.	Weight of Sheets	
		Pounds.	Ounces.
6	14x49	3	14
7	14x52	4	
8	14x57	5	2
9	14x60	5	9
14	14x48	4	
16	14x48	4	4

Gutter Copper—20x72 Inches.

Thickness Wire Gauge.	Thickness of 30x60 sheet.		Sheet of same thickness 20x72.	
No.	Lbs.	Size.	Lbs.	Ozs.
27	10	30x60	9	2
24	12	30x60	10	8
23	14	30x60	13	2

See Copper Sheathing Sheets.

SPUN BRASS KETTLES,

WEIGHT AND CAPACITY OF.

7 in.....	1 lb.....	½ gal	18 in.....	10½ lb.....	10 gal
8 "	1½ "	1 "	19 "	12½ "	12 "
9 "	2½ "	1½ "	20 "	16½ "	14 "
10 "	3 "	2 "	21 "	18 "	17 "
11 "	3½ "	2½ "	22 "	20 "	18 "
12 "	4 "	3 "	23 "	23 "	23 "
13 "	5 "	4 "	24 "	27½ "	25 "
14 "	5¾ "	4½ "	25 "	29 "	30 "
15 "	6½ "	5 "	26 "	32 "	32 "
16 "	7½ "	6 "	27 "	37 "	37 "
17 "	9 "	8 "	28 "	40 "	42 "

Number of Copper Belt Rivets and Burs in one Pound.

Inch....	¼	5/16	⅜	7/16	½	9/16	⅝	¾	⅞	1	1⅛	1¼	1½	Burs
No. 7...	272	250	228	180	164	160	148	112	116	100	84	80	69	345
" 8...	276	248	208	200	178	172	152	136	110	104	96			390
" 9...	340	280	272	248	228	220	184	176	156	136				610
" 10..	544	448	384	340	304	300	272	238	204					716
" 12...	588	512	452	404	354	334	304	272						985
" 13...	996	852	532											1630

Copper Hose Rivets and Burs.

Size.....	5/16	⅜	7/16	½	9/16	⅝	¾	⅞	Burs.
No. 7....			155	142	133	122	109	97	345
" 8....	308	201	181	160	150	135	116	100	390

Copper Oval Head (or Trunk) Rivets and Burs.

	¼	5/16	⅜	7/16	½	9/16	⅝	¾	⅞	1	1⅛	1¼	Burs
No. 9.....	320	285	259	243	219	199	177	159	137	123	113	104	610

Number of Copper Braziers' Rivets in one Pound.

Nos	0	1	2	3	4	5	6	7	8	9	10
	148	100	70	44	34	24	18	12	9	6	4

Bar and Sheet Brass.

WEIGHT IN POUNDS.

Thickness, or Diameter, or Size; Inches.	Sheets per Square Foot.	Square Bars 1 Foot Long.	Round Bars 1 Foot Long.	Thickness, or Diameter, or Size; Inches.	Sheets per Square Foot.	Square Bars 1 Foot Long.	Round Bars 1 Foot Long.
1-16	2.7	.015	.011	1 1-16	45.95	4.07	3.20
⅛	5.41	.055	.045	⅛	49.69	4.55	3.57
3-16	8.12	.125	.1	3-16	51.4	5.08	3.97
¼	10.76	.225	.175	¼	54.18	5.65	4.41
5 16	13.47	.350	.275	5-16	56.85	6.22	4.86
⅜	16.25	.51	.395	⅜	59.55	6.31	5.35
7-16	19.	.69	.54	7-16	62.25	7.45	5.85
½	21.65	.905	.71	½	65.	8.13	6.37
9-16	24.3	1.15	.9	9-16	57.75	8.83	6.92
⅝	27.12	1.4	1.1	⅝	70.35	9.55	7.48
11-16	29.77	1.72	1.35	11-16	73.	10.27	8.05
¾	32.46	2.05	1.60	¾	75.86	11.	8 65
13-16	35.18	2.4	1.85	13-16	78.52	11.82	9.29
⅞	37.85	2.75	2.15	⅞	71.25	72.68	9 95
15-16	40.55	3.15	2.48	15-16	84.	13.5	10.58
1	43.29	3.65	2.85	2	86.75	14.35	11.25

Bar and Sheet Copper.

Weight in Pounds.

Th'ckness, or Diameter, or Size; Inches.	Sheets per Square Foot.	Square Bars 1 Foot Long.	Round Bars 1 Foot Long.	Thickness, or Diameter, or Size; Inches.	Sheets per Square Foot.	Square Bars 1 Foot Long.	Round Bars 1 Foot Long.
1-16	2.88	.015	.011	1 1-16	49.	4.35	3.41
⅛	5.75	.06	.056	⅛	52.	4.86	3 85
3-16	8.65	.134	.105	3-16	54 9	5.40	4.29
¼	11.48	.235	.187	¼	57.65	6.	4.73
5-16	14.36	.375	.295	5-16	60.5	6.60	5.20
⅜	17.28	.54	.424	⅜	53.45	7.27	5.70
7-16	20.19	.735	.575	7-16	66.35	7.90	6.28
½	23.1	.960	.75	½	69.3	8.64	6.80
9-16	26.	1.21	.95	9-16	72.15	9 28	7.30
⅝	28.85	1.51	1 17	⅝	75.1	10.15	8.
11-16	31.68	1.81	1.42	11-16	77 95	10.95	8.6
¾	34.57	2.15	1 7	¾	80.75	11.70	9.24
13-16	36.46	2.54	2.	13-16	83.60	12.60	9.85
⅞	40.39	2.95	2.3	⅞	86.58	13.46	10.56
15-16	43.27	3.37	2.64	15-16	09.45	14.35	11.25
1	46.15	3.84	3.01	2	02.25	15.35	12.

Weight of Iron, Steel, Copper and Brass Plates.

DIAMETER AND THICKNESS DETERMINED BY AMERICAN GAUGE.

No. of Gauge.	Size of each No.	Weight of Plates per Square Foot.			
		Wrought Iron.	Steel.	Copper.	Brass.
	Inch.	Lbs.	Lbs.	Lbs.	Lbs.
0000	.46000	17.25	17.48	20.838	19.688
000	.40964	15.3615	15.5663	18.557	17.533
00	.36480	13.68	13.8624	16.525	15.613
0	.32486	12.1823	12.3447	14.716	13.904
1	.28930	10.8488	10.9934	13.105	12.382
2	.25763	9.6611	9.7899	11.671	11.027
3	.22942	8.6033	8.7180	10.393	9.8192
4	.20431	7.6616	7.7638	9.2552	8.7445
5	.18194	6.8228	6.9137	8.2419	7.787
6	.16202	6.0758	6.1568	7.3385	6.9345
7	.14428	5.4105	5.4826	6.5359	6.1752
8	.12849	4.8184	4 8826	5.8206	5.4994
9	.11443	4.2911	4.3483	5.1837	4.8976
10	.10 89	3.8209	3.8718	4.6155	4.3609
11	.090742	3.4028	3.4482	4.1106	3.8838
12	.080808	3 0303	3.0707	3.6606	3.4586
13	.071961	2.6985	2.7345	3.2598	3.0799
14	.064084	2.4032	2.4352	2.9030	2.7428
15	.057068	2.1401	2.1686	2.5852	2.4425
16	.050820	1.9058	1.9312	2.3021	2.1751
17	.045257	1.6971	1.7198	2.0501	1.937
18	.040303	1.5114	1.5315	1.8257	1.725
19	.035890	1.3459	1.3638	1.6258	1.5361
20	.031961	1.1985	1.2145	1.4478	1.3679
21	.028462	1.0673	1.0816	1.2893	1.2182
22	.025347	.95051	.96319	1.1482	1.0849
23	.022571	.84641	.8577	1.0225	.96604
24	.020100	.75375	.7638	.91053	.86028
25	.017900	.67125	.6802	.81087	.76612
26	.01594	.59775	.60572	.72208	.68223
27	.014195	.53231	.53941	.64303	.60755
28	.012641	.47404	.48036	.57264	.54103
29	.011257	.42214	.42777	.50994	.48180
30	.010025	.37594	.38095	.45413	.42907
31	.008928	.3348	.33926	.40444	.38212
32	.007950	.29813	.3021	.36014	.34026
33	.007080	.2655	.26904	.32072	.30302
34	.006304	.2364	23955	.28557	.26981
35	.005614	.21053	.21333	.25431	.24028
36	.005000	.1875	.19	.2265	.2140
37	.004453	.16699	.16921	.20172	.19059
38	.003965	.14869	.15067	.17961	.1697
39	.003531	.13241	13413	.15995	.15113
40	.003144	.1179	.11947	.14242	.13456
Specific Grav.....		7.200	7.296	8.693	8.218
Weight per Cubic Foot..		450.	456.	543.6	513.6

Seamless Brass and Copper Tubing.

List of Regular Sizes.			Weight per ft.		List of Regular Sizes.			Weight per ft.	
Outside Diam.	Length.	Stubs' Wire Gauge.	Brass.	Copper.	Outside Diam.	Length.	Stubs' Wire Gauge.	Brass.	Copper.
3/16	12 ft.	19	.18	.19	2 1/16	12 ft.	12	2.53	2.66
1/4	"	18	.27	.29	2 1/8	"	12	2.68	2.82
5/16	"	18	.33	.35	2 3/16	"	12	2.84	2.99
3/8	"	17	.46	.49	2 1/4	"	10	3.74	3.94
7/16	"	17	.49	.53	2 5/16	"	10	3.99	4.15
1/2	"	17	.53	.58	2 3/8	"	10	4.14	4.36
9/16	"	16	.63	.67	3	"	10	4.54	4.78
1	"	16	.67	.71	3 1/4	"	10	4.94	5.20
1 1/8	"	16	.76	.80	3 1/2	"	10	5.35	5.63
1 1/4	"	15	.97	1.02	4	"	10	6.14	6.46
1 3/8	"	14	1.22	1.29	4 1/8	"	10	6.33	6.66
1 1/2	"	14	1.36	1.44	4 1/4	"	10	6.52	6.86
1 5/8	"	13	1.65	1.74	4 3/8	"	10	6.72	7.07
1 3/4	"	13	1.79	1.88	4 1/2	"	10	6.92	7.28
1 7/8	"	13	1.83	1.92	4 3/4	"	10	7.30	7.68
1 7/8	"	12	2.19	2.31	5	"	10	7.67	8.08
1 15/16	"	12	2.28	2.40	5 1/2	"	10	8.42	8.94
2	"	12	2.35	2.47	6	"	10	9.31	9.79

Weight of Brass, Copper and Zinc Tubing, per Foot.

NUMBERED BY BROWN & SHARPE'S GAUGE.

Weight in Thousandths of Pounds.

BRASS. No. 17.		BRASS. No. 20.		COPPER. Lightning-Rod Tube. No. 23.	
Inch.	Pounds.	Inch.	Pounds.	Inch.	Pounds.
1/4	.107	1/8	.033	1/2	.162
5/16	.157	3/16	.039	9/16	.176
11/32	.185	1/4	.063	5/8	.186
13/32	.234	5/16	.106	11/16	.211
7/16	.266	3/8	.116	3/4	.229
15/32	.318	7/16	.153		
1/2	.333	1/2	.189	ZINC. No. 20.	
17/32	.377	9/16	.208		
9/16	.462	5/8	.220	1/2	.161
1	.542	11/16	.252	9/16	.185
1 1/8	.675	3/4	.284	5/8	.234
1 1/4	.740	1	.378	11/16	.272
1 3/8	.915	1 1/4	.500	3/4	.311
1 1/2	.980	1 1/2	.580	1	.380
2	1.506			1 1/4	.472
2 1/2	1.90			1 1/2	
3	2.188				

SEAMLESS COPPER TUBING.

Weight per Foot, in Pounds.

O. D.	STUBS' WIRE GAUGE.						O. D.	STUBS' WIRE GAUGE.					
Inches.	11	12	13	14	15	16	Inches.	11	12	13	14	15	16
$\frac{1}{2}$	.57	.50	.46	.41	.37	.33	3	4.35	3.81	3.30	2.90	2.51	2.23
$\frac{5}{8}$	.76	.66	.60	.52	.47	.42	$3\frac{1}{8}$	4.54	3.97	3.44	3.02	2.61	2 32
$\frac{3}{4}$	.94	.82	.74	.64	.58	.52	$3\frac{1}{4}$	4.73	4.13	3.58	3.14	2.72	2.42
$\frac{7}{8}$	1.13	1.00	.88	.76	.69	.62	$3\frac{3}{8}$	4.92	4.29	3.72	3.26	2.82	2.51
1	1.32	1.16	1.02	.89	.80	.71	$3\frac{1}{2}$	5.12	4.47	3.87	3.38	2.93	2.61
$1\frac{1}{8}$	1.51	1.32	1.17	1.01	.91	.80	$3\frac{5}{8}$	5.31	4.64	4.01	3.50	3.04	2.70
$1\frac{1}{4}$	1.71	1.49	1.31	1.14	1.02	.90	$3\frac{3}{4}$	5.50	4 82	4.15	3.62	3.14	2.80
$1\frac{3}{8}$	1.90	1.65	1.46	1.29	1.12	1.00	$3\frac{7}{8}$	5.69	4.99	4.29	3.74	3.24	2.89
$1\frac{1}{2}$	2.08	1.82	1.60	1.44	1.23	1.09	4	5.88	5.15	4.44	3.86		
$1\frac{5}{8}$	2.26	1.98	1.74	1.58	1.34	1.18	$4\frac{1}{8}$	6.06	5.31	4.58	3.98		
$1\frac{3}{4}$	2.46	2.15	1.88	1.70	1.45	1.28	$4\frac{1}{4}$	6.24	5.48	4.72	4.10		
$1\frac{7}{8}$	2.65	2.31	2.02	1 82	1.55	1.37	$4\frac{3}{8}$	6.43	5.64	4.86	4.22		
2	2.84	2.47	2.16	1.94	1.66	1.47	$4\frac{1}{2}$	6.62	5.80	5.00	4.34		
$2\frac{1}{8}$	3.02	2.66	2.30	2.06	1.76	1.56	$4\frac{5}{8}$	6.80	5.96	5.15	4.46		
$2\frac{1}{4}$	3.21	2.82	2 45	2.18	1.86	1.66	$4\frac{3}{4}$	6.99	6.13	5.29	4 58		
$2\frac{3}{8}$	3.40	2.99	2.59	2.30	1.97	1.75	5	7.35	6.46	5.57	4.82		
$2\frac{1}{2}$	3.59	3.15	2.73	2.42	2.07	1.85	$5\frac{1}{4}$	7.74	6.79				
$2\frac{5}{8}$	3.78	3.32	2.87	2.54	2.18	1.94	$5\frac{1}{2}$	8.13	7.12				
$2\frac{3}{4}$	3.97	3.48	3.01	2.66	2.29	2.04	$5\frac{3}{4}$	8.52	7.45				
$2\frac{7}{8}$	4.16	3.65	3.16	2.78	2.40	2.13	6	8.90	7.78				

To ascertain weight of Seamless Brass Tubing, multiply by .95.

IRON PIPE SIZES.

Outside Diam.	Same as Iron Size.	Length.	Weight per ft. Brass. Lbs.	Weight per ft. Copper. Lbs.	Outside Diam.	Same as Iron Size.	Length.	Weight per ft. Brass Lbs.	Weight per ft. Copper. Lbs.
$\frac{13}{16}$	$\frac{1}{8}$	12 ft.	.31	.33	$1\frac{5}{8}$	$1\frac{1}{4}$	12 ft.	2.42	2.54
$\frac{15}{16}$	$\frac{1}{4}$	"	.42	.44	$1\frac{7}{8}$	$1\frac{1}{2}$	"	2.92	3.07
$1\frac{1}{16}$	$\frac{3}{8}$	"	.56	.59	$2\frac{3}{8}$	2	"	3.90	4.09
$1\frac{5}{16}$	$\frac{1}{2}$	"	.81	.85	$2\frac{7}{8}$	$2\frac{1}{2}$	"	5.14	5.41
$1\frac{1}{16}$	$\frac{3}{4}$	"	1.19	1.25	$3\frac{1}{2}$	3	"	8.08	8.50
$1\frac{5}{16}$	1	"	1.66	1.74					

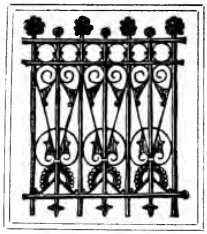
SIZES AND WEIGHT OF COPPER TUBE.

NO. 18 STUBS' WIRE GAUGE.*

INSIDE DIAMETER.	WEIGHT PER FOOT.	INSIDE DIAMETER.	WEIGHT PER FOOT.	INSIDE DIAMETER.	WEIGHT PER FOOT.
$\frac{1}{2}$	.32	$1\frac{1}{4}$	.95	2	1.40
$\frac{5}{8}$	.43	$1\frac{3}{8}$	1.02	$2\frac{1}{8}$	1.50
$\frac{3}{4}$	.55	$1\frac{1}{2}$	1.10	$2\frac{1}{4}$	1.60
$\frac{7}{8}$	.65	$1\frac{5}{8}$	1.15	$2\frac{3}{8}$	1.70
1	.75	$1\frac{3}{4}$	1.20	$2\frac{1}{2}$	1.80
$1\frac{1}{8}$	.85	$1\frac{7}{8}$	1.30		

In ordering, state whether Tubes are to be annealed for bending.

* The above weights are theoretically correct, but in practice deviations from the theoretical weight must be expected.



PENNSYLVANIA WIRE WORKS,

233 Arch Street,

PHILADELPHIA, PA.

EDWARD DARBY & SONS,

MANUFACTURERS OF

Brass, Copper, Steel and Galvanized Wire Cloth,
Foundry Riddles, Brushes and Screens, Shovels,

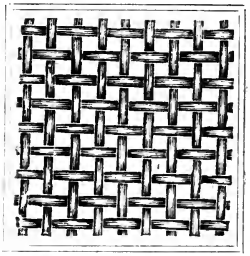
WROUGHT IRON RAILING,

BANK AND OFFICE RAILING,

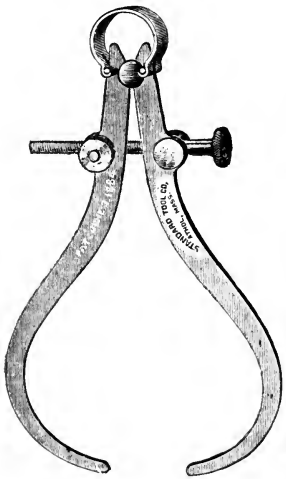
BRASS AND IRON GRILLE WORK.

ART METAL WORK A SPECIALTY.

Wire and Iron Goods of Every Description.



Standard Tool Co.



ATHOL, MASS.

MANUFACTURERS OF

The Celebrated Chaplin Try and Center Square,

STANDARD STEEL RULES, STEEL CALIPER RULES,
UNIVERSAL BEVELS,

DEPTH GAUGES, IMPROVED SURFACE GAUGES,

CALIPER GAUGES, BEVEL PROTRACTORS,
SCREW PITCH AND CENTER GAUGES,

—HARDENED STEEL SQUARES—

GRADUATED STEEL SQUARES, SPRING CALIPERS,
PLIERS, STRAIGHT EDGES, ETC., ETC.

Write for Illustrated Catalogue and Price List of Full Line.

STANDARD WEIGHTS OF LEAD PIPE, Etc.

WEIGHT PER FOOT OF LEAD PIPE AND TIN-LINED LEAD PIPE.

Calibre	AAA Brooklyn.		AA Ex Strong		A Strong.		B Medium.		C Light.		D Ex Light.		E Fountain.	
	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.	Lb.	Oz	Lb.	Oz.	Lb.	Oz.
⅜	1	8	1	5	1	2	1	0	0	13	0	10	0	8
½	3	0	2	0	1	12	1	4	1	0	0	13	0	11
⅝	3	8	2	12	2	8	2	0	1	12	1	8	1	0
¾	4	8	3	8	3	0	2	4	2	0	1	12	1	4
1	6	0	4	12	4	0	3	4	2	8	2	0	1	8
1¼	6	12	5	12	4	12	3	12	3	0	2	8	2	0
1½	9	0	8	0	6	4	5	0	4	4	3	8	3	4
2	10	12	9	0	7	0	6	0	5	4	4	0		

LEAD WASTE PIPE.

1½ inch, 2 lbs.....per foot.
2 " 3 lbs..... "
2½ " 4 and 6 lbs.... "
3 " 3½, 4½ & 5 lbs. "
4 inch, 4½, 5, 6 & 8 lbs...per foot.
4½ inch, 6, 6¾ & 8 lbs... "
5 inch, 8, 10 & 12 lbs.... "
6 " 9¾ and upwards.. "

EXTRA WEIGHTS OF LEAD PIPE.

Calibre.	7-16 Thick.		⅜ Thick.		5-16 Thick.		¼ Thick.		3-16 Thick.	
	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.
2½ inches..	0	0	16	11	13	11	11	0	7	13
3 " ..	0	0	19	10	16	0	12	0	9	0
3½ " ..	26	10	21	10	18	5	15	0	9	8
4 " ..	30	0	25	0	21	0	16	0	12	8
4½ " ..	0	0	0	0	0	0	18	0	14	0
5 " ..	0	0	31	0	0	0	20	0	0	0

PATENT FINISH DROP SHOT.

AMERICAN STANDARD SIZES.

	Diameter in 100ths of an inch.	No of Shot to the oz		Diameter in 100ths of an inch.	No. of Shot to the oz.
Extra Fine Dust..	1½	84021	No. 6.....	11	218
Fine Dust.....	3	10784	" 5.....	12	168
Dust	4	4565	" 4.....	13	132
No. 12.....	5	2326	" 3.....	14	106
" 11.....	6	1346	" 2.....	15	86
" 10.....Trap Shot		1056	" 1.....	16	71
" 10.....	7	848	" B.....	17	59
" 9.....Trap Shot		688	" BB.....	18	50
" 9.....	8	568	" BBB	19	42
" 8.....Trap Shot		472	" T.....	20	36
" 8.....	9	399	" TT.....	21	31
" 7.....Trap Shot		338	" F.....	22	27
" 7.....	10	291	" FF.....	23	24

COMPRESSED BUCK SHOT.

	Diameter in 100ths of an inch.	No. of Balls to the lb		Diameter in 100ths of an inch.	No. of Balls to the lb.
No. 3.....	25	284	No. 00.....	34	115
" 2.....	27	232	" 000.....	36	94
" 1.....	30	173	Balls.....	38	85
" 0.....	32	140	"	44	50

RULES FOR COMPUTING WEIGHTS OF METALS.

I.—CAST IRON.

To find the weight of a cast-iron rod or bar: multiply the weight of a wrought rod or bar from the usual tables, and deduct 2.27 of its weight.

II.—WROUGHT IRON.

To compute the weight of any piece of wrought iron: find the number of cubic inches it contains and multiply by .2816. This will give the weight in pounds.

III.—CAST IRON.

Multiply the number of cubic inches by .2607.

IV.—COPPER.

To compute the weight of copper: ascertain the number of cubic inches, and multiply by .3242.

V.—LEAD.

To compute the weight of lead: multiply the number of cubic inches by .41015.

VI.—BRASS.

To compute the weight of brass: multiply the number of cubic inches by .3112.

USEFUL MATHEMATICAL RULES.

To find the area of a parallelogram: multiply the length by the breadth.

To find the circumference of a circle: multiply the diameter by 3.14159.

To find the diameter of a circle: multiply the circumference by .31831.

To find the area of a circle: multiply the square of the diameter by .7854; or, multiply the square of the circumference by .079577; or, multiply half the diameter by half the circumference.

To find the area of a circular ring: multiply the sum of the diameters of the two circles by the difference of the diameters, and that product by .7854.

To find the side of a square that shall equal the area of a given diameter or circumference: multiply the diameter of the circle by .886227; or, multiply the circumference of the circle by .282094.

To find the diameter of a circle that shall contain the area of a given square: multiply the side of the given square by 1.12838.

To find the side of the largest square that can be inscribed in a circle of a given diameter or circumference: multiply the given diameter by .707106; or, multiply the given circumference by .225079.

To find the circumference of a circle required to exactly admit a square of a given side: multiply the given side by .225079.

VALUE OF IRON.

VALUE PER GROSS TON (2240 LBS.) OF IRON AT FROM 1-10TH OF A CENT TO 10 CENTS PER POUND, INCREASING AT RATE OF 1-10TH OF A CENT PER POUND.

Per Lb.	Per Ton.	Per Lb.	Per Ton.	Per Lb.	Per Ton.
$0.001	$2.24	$0.035	$78.40	$0.068	$152.32
0.002	4.48	0.036	80.64	0.069	154.56
0.003	6.72	0.037	82.88	0.070	156.80
0.004	8.96	0.038	85.12	0.071	158.04
0.005	11.20	0.039	87.36	0.072	161.28
0.006	13.44	0.040	89.60	0.073	163.52
0.007	15.68	0.041	91.84	0.074	165.76
0.008	17.92	0.042	94.08	0.075	168.00
0.009	20.16	0.043	96.32	0.076	170.24
0.010	22.40	0.044	98.56	0.077	172.48
0.011	24.64	0.045	100.80	0.078	174.72
0.012	26.88	0.046	103.04	0.079	176.96
0.013	29.12	0.047	105.28	0.080	179.20
0.014	31.36	0.048	107.52	0.081	181.44
0.015	33.60	0.049	109.76	0.082	183.68
0.016	35.84	0.050	112.00	0.083	185.92
0.017	38.08	0.051	114.24	0.084	188.16
0.018	40.32	0.052	116.48	0.085	190.40
0.019	42.56	0.053	118.72	0.086	192.64
0.020	44.80	0.054	120.96	0.087	194.88
0.021	47.04	0.055	123.20	0.088	197.12
0.022	49.28	0.056	125.44	0.089	199.36
0.023	51.52	0.057	127.68	0.090	201.60
0.024	53.76	0.058	129.92	0.091	203.84
0.025	56.00	0.059	132.16	0.092	206.08
0.026	58.24	0.060	134.40	0.093	208.32
0.027	60.48	0.061	136.64	0.094	210.56
0.028	62.72	0.062	138.88	0.095	212.80
0.029	64.96	0.063	141.12	0.096	215.04
0.030	67.20	0.064	143.36	0.097	217.28
0.031	69.44	0.065	145.60	0.098	219.52
0.032	71.68	0.066	147.84	0.099	221.76
0.033	73.92	0.067	150.08	0.100	224.00
0.034	76.16				

SIZE AND STRENGTH OF CAST-IRON COLUMNS.

Capable of Sustaining Load, Expressed in Cwts.

DIAMETER IN INCHES.

H'g't. Ft.	2½	3	3½	4	4½	5	6	7	8	9	10	11	12
4	119	178	247	320	418	522	607	1032	1333	1716	2119	2570	3050
6	60	105	143	232	318	400	501	59 1	1015	1397	1700	2150	3040
8	40	91	135	214	288	379	479	573	980	1289	1659	2045	2490
10	32	65	111	172	242	327	427	525	924	1224	1603	2007	2450
12	26	55	97	156	220	301	394	497	887	1161	1564	1910	2300

LIST OF EXTRAS ON BAR IRON.

ORDINARY SIZES. { Rounds and Squares. .....$\frac{3}{8}$ to 2 in. diam.
Flats.....1 to 4×$\frac{3}{8}$ to 1½ and 4½ to 6×$\frac{3}{8}$ to 1.

EXTRA SIZES.

Rounds and Squares.	Extra in cts. per lb	Flats.	Extra in cts. per lb	Flats.	Extra in cts. per lb
No 6 and $\frac{3}{16}$ in.	1.3	$\frac{1}{32}\times\frac{3}{32}$	4.0	$\frac{7}{16}\times\frac{7}{32}$.....	1.5
No. 5.....	1.0	$\frac{1}{32}\times\frac{1}{8}$	3.5	$\frac{7}{16}\times\frac{1}{4}$	1.3
No. 4.....	0.8	$\frac{1}{32}\times\frac{5}{32}$.....	3.0	$\frac{1}{8}$ & $\frac{1}{16}\times\frac{3}{16}$.....	1.2
Nos. 2, 3, $\frac{1}{4}$ & $\frac{9}{32}$	0.7	$\frac{1}{32}\times\frac{3}{16}$.....	2.5	$\frac{1}{8}$ & $\frac{3}{16}\times\frac{1}{4}$ to $\frac{3}{8}$.....	1.1
$\frac{5}{16}$.....	0.6	$\frac{3}{8}\times\frac{3}{32}$.....	3.6	$\frac{5}{8}$ & $\frac{1}{16}\times\frac{7}{16}$.....	0.9
$\frac{3}{8}$.....	0.5	$\frac{3}{8}\times\frac{1}{8}$.....	3.0	$\frac{5}{8}$ & $\frac{1}{16}\times\frac{1}{4}$ & $\frac{5}{16}$.....	0.7
$\frac{7}{16}$.....	0.4	$\frac{3}{8}\times\frac{5}{32}$.....	2.5	$\frac{5}{8}$ & $\frac{1}{16}\times\frac{3}{8}$ to $\frac{1}{2}$.....	0.5
$\frac{1}{2}$ & $\frac{9}{16}$.....	0.2	$\frac{3}{8}\times\frac{1}{16}$.....	2.3	$\frac{3}{8}\times\frac{3}{16}$.....	0.7
$\frac{5}{8}$ & $\frac{11}{16}$.....	0.1	$\frac{3}{8}\times\frac{3}{16}$.....	2.0	$\frac{3}{8}\times\frac{1}{4}$ & $\frac{5}{16}$.....	0.5
2⅛ to 2⅞.....	0.1	$\frac{3}{8}\times\frac{7}{32}$.....	1.8	$\frac{3}{8}\times\frac{3}{8}$ to $\frac{5}{8}$.....	0.4
3 to 3½.....	0.3	$\frac{3}{8}\times\frac{1}{4}$.....	1.6	$\frac{7}{8}\times\frac{3}{16}$.....	0.6
$3\frac{9}{16}$ to 4.....	0.5	$\frac{1}{2}\times\frac{3}{32}$.....	3.0	$\frac{7}{8}\times\frac{1}{4}$ & $\frac{5}{16}$.....	0.5
$4\frac{1}{16}$ to $4\frac{1}{2}$.....	0.6	$\frac{1}{2}\times\frac{1}{8}$.....	2.6	$\frac{7}{8}\times\frac{3}{8}$ to $\frac{3}{4}$.....	0.4
$4\frac{9}{16}$ to 5.....	0.8	$\frac{1}{2}\times\frac{1}{64}$.....	2.5	$1\times\frac{3}{16}$.....	0.4
HALF ROUND.		$\frac{1}{2}\times\frac{5}{32}$.....	2.2	1 to $6\times\frac{1}{4}\times\frac{5}{16}$	0.2
		$\frac{1}{2}\times\frac{3}{16}$.....	1.8	2 to $4\times1\frac{3}{16}$ to 2..	0.2
⅞ to 1¼.....	0.5	$\frac{1}{2}\times\frac{7}{32}$.....	1.6	2 to $4\times2\frac{1}{16}$ to 3..	0.3
$\frac{1}{4}$ & $\frac{13}{16}$.....	0.6	$\frac{1}{2}\times\frac{1}{4}$.....	1.4	$4\frac{1}{16}$ to $6\times1\frac{1}{16}$ to 2	0.2
$\frac{5}{8}$ & $\frac{11}{16}$.....	0.7	$\frac{7}{16}\times\frac{1}{8}$.....	2.3	$4\frac{1}{16}$ to $6\times2\frac{1}{16}$ to 3	0.4
$\frac{1}{2}$ & $\frac{9}{16}$.....	0.9	$\frac{7}{16}\times\frac{5}{32}$.....	1.9		
$\frac{3}{8}$ & $\frac{7}{16}$.....	1.1	$\frac{7}{16}\times\frac{3}{16}$.....	1.6		

For cutting to specific lengths, 10 to 20 feet, 0.2 cent extra.

CAST STEEL CROWBARS.

Weight.....	—	8	10	12	14	16	18
Inch Square.....	—	⅞	1	$1\frac{1}{16}$	$1\frac{1}{8}$	$1\frac{3}{16}$	$1\frac{1}{4}$
Inches in Length.	—	48	54	62	63	66	67
Weight.....	20	22	24	26	28	30	
Inch Square.....	$1\frac{1}{4}$	$1\frac{5}{16}$	1⅜	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{1}{2}$	
Inches in Length..	72	72	72	74	74	76	

COPPER SHEATHING SHEETS.

Sheathing is the name applied only to sheets measuring 14x48 inches.
Showing Wt. per sheet, No. of sheets per case and Wt per case.

Oz. per sq. foot...	16	18	20	22	24	26	28	30	32
Pounds per sheet.	4.10	5.4	5.13	6.7	7.	7.9	8.3	8.12	9.5
Sheets per case...	125	115	100	100	85	80	75	70	65
Pounds per case..	583	604	583	642	595	607	613	613	607

WEIGHT OF HOOP IRON.

One Foot in Length.

Thickness.		$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{3}{4}$	2
No.	Inch.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
21.....	.0334	.0716	.0861	.1	.115	.129	.144	.158	.172	.197	.201	.229
20.....	.0375	.0731	.0938	.109	.125	.141	.156	.172	.188	.203	.219	.25
19.....	.0438	.0911	.109	.128	.146	.164	.182	.2	.219	.238	.257	.292
18.....	.05	.104	.125	.146	.167	.188	.208	.229	.25	.271	.292	.333
17.....	.0563	.117	.141	.164	.188	.211	.234	.258	.281	.305	.328	.375
16.....	.0625	.13	.156	.182	.208	.234	.26	.286	.313	.339	.365	.417
15.....	.075	.156	.188	.219	.25	.281	.413	.344	.375	.307	.438	.5
14.....	.0875	.183	.219	.256	.293	.239	.366	.402	.438	.475	.512	.585
13.....	.1	.203	.25	.292	.333	.375	.416	.458	.5	.543	.584	.667
12.....	.1125	.234	.281	.328	.375	.422	469	.516	.563	.609	.656	.75
11.....	.125	.26	.313	.365	.417	.469	.521	.573	.625	.677	.729	.833
10.....	.1406	.293	.352	.41	.469	.527	.586	.645	.703	.762	.82	.838
9.....	.1563	.326	.391	.456	.522	.587	.652	.717	.783	.848	.913	1.04
8	.1919	.358	.43	.501	.573	.644	.716	.788	.859	.931	1.	1.15
7.....	.1875	.391	.469	.547	.625	.703	.781	.859	.938	1.02	1.1	1.25
6.....	.2031	.423	.508	.593	.677	.762	.836	.931	1.02	1.1	1.19	1.35
5	.2188	.456	.547	.638	.729	.82	.912	1.	1.09	1.19	1.28	1.46
4.....	.2344	.488	586	.683	781	.879	.977	1.07	1.17	1.27	1.37	1.56

HOOP AND SCROLL IRON.

Number of Feet in a Bundle of 56 Pounds.

HOOP IRON.

Size.		Feet in Bundle.
Width.	Thick	
$\frac{5}{8}$ inches.	No. 21	815
$\frac{3}{4}$ inches.	No. 20	630
$\frac{7}{8}$ inches.	No. 19	450
1 inches.	No. 18	360
$1\frac{1}{8}$ inches.	No. 17	278
$1\frac{1}{4}$ inches.	No. 16	217
$1\frac{3}{8}$ inches.	No. 15	160
$1\frac{1}{2}$ inches.	No. 15	139
2 inches.	No. 14	110

SCROLL IRON.

Size.		Feet in Bundle.
Width.	Thick.	
$\frac{1}{2}$ inches.	No. 10	240
$\frac{5}{8}$ inches.	No. 16	430
$\frac{3}{4}$ inches.	No. 14	347
$\frac{5}{8}$ inches.	No. 1	190
$\frac{3}{4}$ inches	No. 16	360
$\frac{3}{4}$ inches.	No. 14	290
$\frac{7}{8}$ inches.	No 12	208
1 inches.	No. 10	160
1 inches.	No. 16	310
1 inches.	No. 14	249
1 inches.	No. 12	175
1 inches.	No. 16	270
1 inches.	No. 14	216
1 inches.	No. 12	152

BREAKING STRAIN UPON VARIOUS METALS.

The size of the rod tested being in each case one inch square, and the number of pounds the actual breaking strain.

	Lbs.		Lbs.
Cast iron.....	19,000	Zinc.....	2,600
Ordinary bar iron.....	70,000	Tin.....	5,500
Best Swedes iron.....	84,000	Copper.....	35,000
Soft steel.....	120,000	Silver.....	41,000
Hard steel.....	150,000	Gold.....	22,000
Lead.....	860		

Weight of Flat Iron.

WEIGHT OF RUNNING FOOT IN POUNDS.

Width in Inches.	Thickness in Inches.					
	1-16	1-8	3 16	1-4	5-16	3-8
1	.21	.41	.62	.83	1.04	1.25
1/16	.23	.47	.7	.94	1.17	1.41
1/8	.26	.52	.78	1.04	1.3	1.56
3/16	.29	.57	.86	1.14	1.43	1.72
1/4	.31	.62	.94	1.25	1.56	1.87
5/16	.34	.68	1.01	1.35	1.69	2.03
3/8	.36	.73	1 09	1 46	1 82	2.19
7/16	.39	.78	1.17	1.56	1.95	2.34
2	.42	.83	1.25	1.67	2.08	2.5
1/16	.44	.88	1.33	1.77	2.21	2.65
1/8	.47	.94	1.4	1.87	2.34	2.81
3/16	.5	.99	1.48	1.98	2 47	2.97
1/4	.52	1.04	1.56	2.09	2.6	3.12
5/16	.55	1 09	1.64	2.19	2.73	3.28
3/8	.57	1.14	1.72	2.29	2.86	3.44
7/16	.6	1.2	1.8	2.4	2.99	3.59
3	.62	1.25	1.87	2.5	3.12	3.75
1/16	.65	1.3	1.95	2.6	3.26	3.91
1/8	.68	1.35	2.03	2.7	3.38	4.06
3/16	.7	1.4	2 11	2.81	3.52	4.22
1/4	.73	1.46	2.19	2.91	3.65	4.37
5/16	.76	1.51	2.27	3.02	3.78	4.53
3/8	.78	1.56	2.34	3.12	3.91	4.69
7/16	.81	1.61	2.42	3.23	4.03	4.84
4	.83	1.66	2.5	3.33	4.17	5.00
1/16	.86	1.72	2.58	3.44	4.3	5.16
1/8	.88	1.77	2.66	3.54	4.43	5.31
3/16	.91	1.82	2.73	3.64	4.55	5 47
1/4	.94	1 87	2 81	3.75	4.69	5.62
5/16	.96	1.93	2.89	3.85	4.82	5.78
3/8	.99	1.98	2.97	3.96	4 95	5.94
7/16	1.01	2. 3	3.05	4 06	5.08	6.1
5	1.04	2. 8	3.12	4.17	5.21	6.25
1/16	1.06	2.13	3.2	4.27	5.34	6.41
1/8	1.1	2 19	3.28	4.37	5.47	6.56

Width in Inches.	Thickness in Inches.					
	1-16	1-8	3-16	1-4	5-16	3-8
5 3/16	1.12	2.24	3.36	4.48	5.6	6.72
1/16	1.14	2.29	3.44	4.58	5.73	6.88
1/8	1.17	2.34	3.52	4.69	5.86	7.03
3/16	1.2	2.39	3.59	4.79	6.	7.19
1/4	1.22	2.45	3.67	4 9	6.12	7.34
5/16	1.25	2.5	3 75	5.	6.25	7.5
6	1.27	2.55	3.83	5.1	6.39	7.66
1/16	1.3	2.6	3.91	5.2	6.51	7.81
1/8	1.32	2.66	3.98	5.31	6.64	7.97
3/16	1.35	2.7	4.06	5.41	6.77	8.13
1/4	1.38	2.76	4.14	5.52	6.91	8.29
5/16	1.40	2.81	4.22	5.62	7.08	8.44
3/8	1.43	2.86	4.3	5.73	7.16	8.59
7/16	1.46	2.92	4.37	5.83	7.29	8.75
7	1.51	3.02	4.53	6.04	7.55	9.07
1/16	1.56	3.12	4.69	6.25	7.81	9.37
1/8	1.61	3.23	4.84	6.46	8.07	9.69
3/16	1.67	3.33	5.	6.67	8.33	10.
1/4	1.72	3.43	5.16	6.87	8.6	10.3
5/16	1.77	3.54	5.32	7.08	8.85	10.63
3/8	1.82	3.65	5.47	7.29	9.11	10.94
7/16	1.87	3.75	5.62	7.5	9 37	11.25
9	1.93	3.85	5.78	7.71	9.63	11 56
1/16	1 98	3.96	5.94	7.92	9 89	11.87
1/8	2.03	4.06	6.09	8.12	10.15	12.19
3/16	2.08	4.17	6.25	8.33	10.4	12.5
10	2.13	4.27	6.4	8.54	10.67	12.8
1/16	2.19	4.37	6.56	8.75	10.93	13.13
1/8	2.24	4.48	6.72	8.96	11.20	13.43
3/16	2.29	4.58	6.87	9.16	11.45	13.75
1/4	2.34	4.69	7.03	9.37	11.72	14.06
5/16	2.39	4.79	7.18	9.58	11.97	14.37
3/8	2.45	4.89	7.34	9.79	12.25	14.69
12	2.5	5.	7.5	10.	12.5	15.
	.....	.....	.....	.....	.....	.....

Weight of Flat Iron—Continued.

WEIGHT OF RUNNING FOOT IN POUNDS.

Width in Inches.	Thickness in Inches.					
	7-16	1-2	5-8	3-4	7-8	1
1	1.46	1.67	2.08	2.5	2.92	3.33
1/8	1.64	1.87	2.34	2.81	3.28	3.75
1/4	1.82	2.08	2.6	3 12	3.65	4.17
3/8	2.01	2.29	2.86	3.44	4.01	4.58
1/2	2.19	2.5	3.12	3 75	4.37	5.
5/8	2.37	2.71	3.38	4.06	4.74	5.42
3/4	2.55	2.92	3.64	4.37	5.1	5.83
7/8	2.73	3.12	3.9	4 69	5.47	6.25
2	2.92	3.33	4.16	5.	5.83	6.67
1/8	3.1	3.54	4.43	5.31	6.2	7.08
1/4	3.28	3.75	4.69	5.62	6.56	7.5
3/8	3.46	3.96	4.95	5.94	6.93	7.92
1/2	3.65	4.17	5.21	6 25	7.29	8.33
5/8	3.83	4.37	5.47	6.56	7.66	8.75
3/4	4.01	4.58	5.73	6.88	8.02	9.17
7/8	4.19	4.79	5.99	7.19	8.39	9.58
3	4.37	5.	6.25	7.5	8.75	10.
1/8	4.56	5.21	6.51	7.82	9.12	10.42
1/4	4.74	5.42	6.77	8.12	9.48	10.83
3/8	4.92	5.62	7.03	8.44	9.84	11.25
1/2	5.1	5.83	7.29	8.75	10.21	11.67
5/8	5.29	6.04	7.55	9.07	10.59	12.08
3/4	5.47	6.25	7.81	9.37	10.93	12.5
7/8	5.65	6.46	8.07	9.68	11.3	12.92
4	5.83	6.67	8.33	10.	11.65	13.33
1/8	6.02	6 87	8.59	10.3	12.04	13.75
1/4	6.2	7.08	8.85	10 62	12 4	14.15
3/8	6.38	7.29	9.11	10.93	12.75	14.59
1/2	6.56	7.5	9.37	11.25	13.12	15 00
5/8	6.74	7.71	9.64	11.55	13.5	15.42
3/4	6.93	7.92	9.89	11.87	13.85	15.83
7/8	7.11	8 12	10.15	12.2	14.22	16.25
5	7.29	8.33	10.42	12.5	14.59	16.65
1/8	7.48	8.54	10.69	12.8	14.95	17.09
1/4	7.66	8.75	10.93	13.13	15.3	17.5
5 3/8	7.84	8.96	11.2	13.43	15.68	17.92
1/2	8.02	9.17	11.45	13.75	16.03	18.33
5/8	8.2	9.37	11.72	14.07	16 4	18.75
3/4	8.39	9.58	11.99	14.37	16.77	19.15
7/8	8.57	9.79	12.25	14.7	17 13	19.58
6	8.75	10.	12.5	15.	17.5	20.
1/8	8.93	10.2	12.77	15.3	17.85	20.42
1/4	9.11	10.42	13.02	15.62	8.23	20.83
3/8	9.3	10.63	13.29	15.93	18.6	21.25
1/2	9.48	10.83	13.53	16.25	18.97	21.65
5/8	9.67	11.03	13.81	16.57	19.33	22.08
3/4	9.84	11.25	14.05	16.87	19.7	22.5
7/8	10.02	11.45	14.32	17.19	20.03	22.92
7	10.2	11.65	14.59	17.5	20.42	23.33
1/8	10.59	12.09	15.1	18.13	21.15	24.15
1/2	10.93	12.5	15.62	18.73	21.85	25.
3/4	11.31	12.92	16.15	19.39	22.62	25.83
8	11.66	13.33	16.65	20.	23.33	26.65
1/4	12 03	13.75	17.18	20.6	24.05	27.5
1/2	12.4	14.17	17.7	21.25	24.8	28.33
3/4	12.76	14.58	18.23	21.89	25.52	29.17
9	13.12	15.	18.75	22.5	26.23	30.
1/4	13.5	15.42	19.27	23.12	26.98	30 83
1/2	13.85	15.83	19.78	23.73	27.7	31.67
3/4	14.2	16.25	20.32	24.35	28.42	32.5
10	14.59	16 65	20.82	25.	29.15	33.33
1/4	14.93	17.08	21.33	25.62	29.88	34.17
1/2	15.3	17.5	21.89	26 25	30.62	35.
3/4	15.67	17.92	22.4	26.85	31.33	35.83
11	16.03	18.33	22.9	27.5	32.08	36.65
1/4	16.4	18.75	23.43	28.12	32.8	37.5
1/2	16.75	19.15	23.93	28.73	33 52	38.33
3/4	17.13	19.59	24.49	29 35	34.25	39.15
12	17.5	20.	25.	30.	35.	40.
	.....	.....	.....	.....	.....	.....

FLAT IRON.

NUMBER OF FEET IN A BUNDLE OF 112 POUNDS.

Size.	Feet in Bundle.	Size.	Feet in Bundle.
½ by ¼ inch	267	⅞ by ¼ inch	155
½ " 5-16 "	216	⅞ " 5-16 "	122
½ " ⅜ "	175	⅞ " ⅜ "	100
⅝ " ¼ "	214	⅞ " 7-16 "	90
⅝ " 5-16 "	170	⅞ " ½ "	75
⅝ " ⅜ "	145	⅞ " ⅝ "	60
⅝ " ½ "	106	1 " ¼ "	135
¾ " ¼ "	175	1 " 5-16 "	106
¾ " 5-16 "	142	1 " ⅜ "	90
¾ " ⅜ "	120	1 " 7-16 "	78
¾ " 7-16 "	103	1 " ½ "	65
¾ " ½ "	90	1 " 9-16 "	60
¾ " ⅝ "	70	1 " ⅝ "	52

Round and Square Iron.

NUMBER OF FEET IN A BUNDLE OF 112 POUNDS.

ROUND IRON. Size.	Feet in Bundle.	SQUARE IRON. Size.	Feet in Bundle.
3-16 inch	1115	3-16 inch	958
¼ "	688	¼ "	540
5-16 "	440	5-16 "	345
⅜ "	305	⅜ "	240
7-16 "	225	7-16 "	176
½ "	170	½ "	135
9-16 "	136	9-16 "	107
⅝ "	110	⅝ "	87
11-16 "	90	11-16 "	70
¾ "	75	¾ "	60

Round Bar Iron.

WEIGHT OF A RUNNING FOOT IN POUNDS.

Diam. Inch.	Wt. per foot. Lbs.	Diam. Inch.	Wt. per foot. Lbs.	Diam. Inch.	Wt. per foot. Lbs.	Diam. Inch.	Wt. per foot. Lbs.
1-16	.01	1 1-16	2.975	2 1/16	11.9	4 1/16	44.85
1/8	.0411	1/8	3.338	1/4	13.3	1/4	47.54
3-16	.0925	3-16	3.725	3/8	14.75	3/8	50.33
1/4	.1651	1/4	4.12	1/2	16.4	1/2	53.32
5-16	.2573	5-16	4.545	5/8	18.1	5/8	56.34
3/8	.371	3/8	5.	3/4	19.85	3/4	59.44
7-16	.505	7-16	5.455	7/8	21.5	7/8	62.62
1/2	.657	1/2	5.945	3	23.7	5	65.88
9-16	.835	9-16	6.445	1/16	25.55	1/16	69.23
5/8	1 031	5/8	6.975	1/4	27.81	1/4	72.65
11-16	1.235	11-16	7.52	3/8	29 85	3/8	76.18
3/4	1.475	3/4	8.05	1/2	32.25	1/2	79.75
13-16	1.74	13-16	8.65	5/8	34.45	5/8	83.45
7/8	2 015	7/8	9.25	3/4	37.1	3/4	87.20
15-16	2 317	15-16	9.9	7/8	39.5	7/8	91.50
1	2.625	2	10.55	4	41.95	6	95.

FOR STEEL multiply tabular number above (for size) 1.01.

SQUARE BAR IRON.

WEIGHT OF A RUNNING FOOT, IN POUNDS.

Thick Inch.	Wt. per ft. Lbs.	Thick Inch.	Wt. per ft. Lbs.	Thick Inch.	Wt. per ft. Lbs.	Thick Inch.	Wt. per ft. Lbs.
1-16	0131	1 1-16	3.80	2 1-8	15.15	4 1-8	57.20
1-8	.0525	1-8	4.25	1-4	17.	1-4	60.75
3-16	.1182	3-16	4.73	3-8	18 5	3-8	64.35
1-4	.2103	1-4	5.25	1-2	25.5	1-2	68.
5-16	.3200	5-16	5.78	5-8	23.1	5-8	72.
3-8	.4735	3-8	6.35	3-4	25.2	3-4	75.65
7-16	.6445	7-16	6.95	7-8	27.5	7-8	79.80
1-2	.84	1-2	7.55	3	30.05	5	83.8
9-16	1.063	9-16	8.2	1-8	32.75	1-8	88.25
5-8	1.314	5-8	8.85	1-4	35.5	1-4	92.5
11-16	1.59	11-16	9.57	3-8	38.25	3-8	97.15
3-4	1.8	3-4	10.30	1-2	41.15	1-2	101.
13-16	2.221	13-16	11.05	5-8	44.15	5-8	105.8
7-8	2.575	7-8	11.83	3-4	47.20	3-4	110.5
15-16	2.95	15.16	12.62	7-8	50.25	7-8	115 15
1	3.35	2	13.4	4	53.75	6	120.25

FOR STEEL multiply tabular number above (for size) by 1.01.

BAND IRON.

NUMBER OF FEET IN A BUNDLE OF 112 POUNDS.

Size.		Feet in Bundle.	Size.		Feet in Bundle.
Width.	Thick.		Width.	Thick.	
1⅛ inches.	No. 12	265	2¾ inches	No. 12	110
1⅛ "	" 10	213	2¾ "	" 10	88
1⅛ "	" 7	160	2¾ "	" 8	72
1¼ "	" 12	246	2¾ "	" 6	60
1¼ "	" 10	190	3 "	" 12	101
1¼ "	" 7	145	3 "	" 10	80
1½ "	" 12	205	3 "	" 8	66
1½ "	" 10	160	3 "	" 6	57
1½ "	" 7	120	3¼ "	" 10	75
1¾ "	" 12	175	3¼ "	" 8	60
1¾ "	" 10	138	3¼ "	" 6	50
1¾ "	" 8	110	3½ "	" 10	69
1¾ "	" 7	100	3½ "	" 8	57
2 "	" 12	155	3½ "	" 6	48
2 "	" 10	120	4 "	" 10	60
2 "	" 8	99	4 "	" 8	50
2 "	" 7	90	4 "	" 6	40
2 "	" 6	81	4¼ "	" 10	52
2¼ "	" 12	135	4½ "	" 8	43
2¼ "	" 10	105	4½ "	" 6	35
2¼ "	" 8	88	5 "	" 10	48
2¼ "	" 6	72	5 "	" 8	40
2½ "	" 12	120	5 "	" 6	34
2½ "	" 10	95	6 "	" 10	40
2½ "	" 8	77	6 "	" 8	32
2½ "	" 6	65	6 "	" 6	26

Weight of Sheet and Plate Iron.

THICKNESS BY BIRMINGHAM WIRE GAUGE AND INCHES, WEIGHT OF A SQUARE FOOT IN POUNDS.

THICKNESS.		Weight Pounds.	THICKNESS.		Weight Pounds.
B. W. Gauge.	Part of an inch.		B. W. Gauge.	Part of an inch.	
36	.004	.126	11	.120	4.48
35	.005	.2 2		7/64 or .125	5.054
34	.007	.283	10	.134	5.426
33	.008	.322	9	.148	5.98
32	.009	.364		5-32 or .1562	6.305
31	.010	.405	8	.165	6.605
30	.012	.485	7	.180	7.27
29	.013	.526		3-16 or .1875	7.578
28	.014	.595	6	.203	8.005
27	.016	.677		7-32 or .2187	8 79
26	.018	.755	5	.22	8.912
25	.020	.811	4	.238	9.62
24	.022	.912		1/4 or .25	10.09
23	.025	1.018	3	.259	10437
22	.028	1.137		9-32 or .2812	11.38
	1-32 or .03125	1.259	2	.284	11.525
21	.032	1.31	1	.3	12.15
20	.035	1.416		5.16 or .3525	12.58
19	.042	1.695	0	.340	13.750
18	.049	1.075		11-32 or .3437	13.875
17	.058	2.35		3/8 or .375	15.10
16	.065	2.637	00	.380	15.26
	1-16 or .0625	2.518		13 32 or .4062	16.34
15	.072	2.92	000	.425	17 125
14	.083	3.35		8-16 or .4375	17.65
	3-32 or .0937	3 78	0000	.454	18.30
13	.095	3.85		15-32 or .4607	18.90
12	.100	4.4	00000	1/2 or .50	20.20

Weight of Sheet and Plate Iron.

THICKNESS IN INCHES. WEIGHT OF A SQUARE FOOT IN POUNDS.

Inches Thick.	Lbs. per Square Foot	Inches Thick.	Lbs. per Square Foot	Inches Thick.	Lbs. per Square Foot.
9-16	22.5	1 3/4	70.62	3 3/8	156.51
5/8	25.21	13-16	73.14	4	161.55
11-16	27.75	7/8	75 58	1/8	166.6
3/4	30.25	15 16	78.20	1/4	171.76
13-16	32.75	2	80.75	3/8	176.71
7/8	35.26	1/8	85.75	1/2	181.77
15-16	37.75	1/4	90.81	5/8	186.79
1	40.35	3/8	95.86	3/4	191.84
1-16	42.87	1/2	100.9	7/8	196.9
1/8	45.4	5/8	105.95	5	201.85
3-16	47.9	3/4	111.	1/8	206.9
1/4	50.45	7/8	116.1	1/4	211.95
5-16	52.96	3	121.15	3/8	217.
3/8	55.45	1/8	126.21	1/2	222.05
7-16	58.01	1/4	131.26	5/8	227.01
1/2	60.52	3/8	136.32	3/4	232.15
9-16	63.05	1/2	141.37	7/8	237.2
5/8	65.56	5/8	146.41	6	242.25
11-16	68.11	3/4	151.46		

For STEEL PLATES multiply tabular numbers above (for Size) by 1.01.

Weight and Thickness of Boiler Iron.

1-8 inch	weighs 5	lbs. per	sq. ft.
3-16 "	" $7\frac{1}{2}$	"	"
1-4 "	" 10	"	"
5-16 "	" $12\frac{1}{2}$	"	"
3-8 "	" 15	"	"
7-16 "	" $17\frac{1}{2}$	"	"
1-2 "	" 20	"	"

No. 1 Iron	is...5-16	inch	thick.
No. 3 "	...9-32	"	
No. 4 "	...1-4	"	
No. 5 "	...7-32	"	
No. 7 "	...3-16	"	

Thickness of Boiler Iron Required

AND PRESSURES ALLOWED BY THE LAWS OF THE UNITED STATES.

Pressure equivalent to the Standard for a Boiler 42-in. in diameter and $\frac{1}{4}$ in thickness.

Thickness in 16ths.	Diameter in inches.						
	34	36	38	40	42	44	46
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs	Lbs.	Lbs.
5	169.9	160.4	152.	144.4	137.5	131.2	125.5
$4\frac{1}{2}$	158.5	149.7	141.8	134.7	128.3	122.5	117 2
$4\frac{1}{4}$	147.2	139.1	131.8	125.1	119.2	113.7	108.8
4	135.9	128.3	121.6	115.5	110.	105	100.
$3\frac{2}{3}$	124.5	117.6	111.3	105.9	100.8	96.2	92.
$3\frac{1}{3}$	113.2	106.9	101.3	96.2	91.7	87.5	83..
3	101.9	96.2	91.2	82 6	82.5	78.7	75..

Number of Burden's Rivets in 100 Lbs.

Length, Inches.	Thickness in inches.				Length, Inches.	Thickness in inches.			
	1-2	5-8	11-16	3-4		1-2	5-8	11-16	3-4
$\frac{3}{4}$	1,092	665			$3\frac{1}{4}$	433	267	212	180
$\frac{7}{8}$	1,027	597			$\frac{3}{4}$	413	248	201	169
1	940	538	450		$\frac{7}{8}$	395	241	192	160
$\frac{1}{8}$	840	512	415		4		230	184	158
$\frac{1}{4}$	797	487	389	356	$\frac{1}{4}$		220	177	150
$\frac{3}{8}$	760	460	370	329	$\frac{3}{4}$		210	171	146
$\frac{1}{2}$	730	440	357	280	$\frac{7}{8}$		200	166	138
$\frac{5}{8}$	711	420	340	271	5		190	161	135
$\frac{3}{4}$	693	390	325	262	$\frac{1}{4}$		180	156	130
$\frac{7}{8}$	648	375	312	257	$\frac{3}{4}$		172	151	124
2	608	360	297	243	$\frac{7}{8}$		164	145	120
$\frac{1}{8}$	573	354	289	237	6		157	140	115
$\frac{1}{4}$	555	347	280	232	$\frac{1}{4}$		150	138	111
$\frac{3}{8}$	525	335	260	220	$\frac{3}{4}$		146	134	107
$\frac{1}{2}$	500	312	242	208	$\frac{7}{8}$		143	129	104
3	460	290	224	197	7		140	125	100

GALVANIZED SHEET IRON.

[*From "The Volta Iron Co.," Pittsburgh, Pa.*]

TABLE, showing Gauges, with Weights per Square Foot; List Price per Pound; Cost per Square Foot at List, together with Cost per Pound and per Square Foot at Different Discounts, ranging from 35 per cent. to 75 per cent.

In this Table prices are calculated to three places of decimals, which is sufficiently accurate for all practical purposes.

Gauge Number			14	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Weight per square foot, oz.			60	48	43	38	33	28	24	21	19	17	16	15	14	13	
List price per pound			.12	.12	.12	.12	.12	.12	.13	.13	.13	.13	.14	.14	.15	.16	
Cost per square foot at List			.45	.36	.353	.285	.248	.21	.195	.171	.154	.138	.14	.131	.151	.13	
Cost at 35 per cent. discount		per lb.	.078	.078	.078	.078	.078	.078	.085	.085	.085	.085	.091	.091	.098	.104	.117
		per sq. ft.	.293	.234	.21	.185	.161	.137	.127	.111	.10	.09	.091	.085	.085	.085	.088
		per lb.	.075	.075	.075	.075	.075	.075	.081	.081	.081	.081	.088	.088	.094	.10	.113
" 37½ "		per sq. ft.	.281	.225	.202	.178	.155	.131	.122	.107	.096	.086	.088	.082	.082	.081	.084
		per lb.	.072	.072	.072	.072	.072	.072	.078	.078	.078	.078	.084	.084	.09	.096	.108
" 40 "		per sq. ft.	.27	.216	.194	.171	.149	.126	.117	.102	.093	.083	.084	.079	.079	.078	.081
		per lb.	.069	.069	.069	.069	.069	.069	.075	.075	.075	.075	.081	.081	.086	.092	.104
" 42½ "		per sq. ft.	.259	.207	.185	.164	.142	.121	.112	.098	.089	.079	.081	.076	.075	.075	.078
		per lb.	.066	.066	.066	.066	.066	.066	.072	.072	.072	.072	.077	.077	.083	.088	.095
" 45 "		per sq. ft.	.248	.198	.177	.157	.136	.116	.107	.094	.085	.076	.077	.072	.072	.072	.074
		per lb.	.063	.063	.063	.063	.063	.063	.068	.068	.068	.068	.074	.074	.079	.084	.095
" 47½ "		per sq. ft.	.236	.189	.169	.115	.13	.11	.102	.09	.081	.073	.074	.069	.069	.068	.071
		per lb.	.06	.06	.06	.06	.06	.06	.065	.065	.065	.065	.07	.07	.075	.18	.09
" 50 "		per sq. ft.	.225	.18	.161	.143	.124	.105	.098	.085	.077	.069	.07	.066	.066	.065	.068
		per lb.	.057	.057	.057	.057	.057	.057	.062	.062	.062	.062	.067	.067	.071	.076	.086
" 52½ "		per sq. ft.	.214	.171	.153	.136	.118	.10	.093	.081	.073	.066	.067	.062	.062	.062	.064
		per lb.	.054	.054	.054	.054	.054	.054	.059	.059	.059	.059	.063	.063	.068	.072	.081
" 55 "		per sq. ft.	.203	.162	.145	.128	.111	.095	.088	.077	.065	.062	.063	.059	.059	.059	.061
		per lb.	.051	.051	.051	.051	.051	.051	.055	.055	.055	.055	.06	.06	.064	.068	.077
" 57½ "		per sq. ft.	.191	.153	.137	.121	.105	.089	.083	.073	.066	.059	.06	.056	.056	.055	.057
		per lb.	.048	.048	.048	.048	.048	.048	.052	.052	.052	.052	.056	.056	.06	.064	.072
" 60 "		per sq. ft.	.18	.144	.129	.114	.099	.084	.078	.068	.062	.055	.056	.052	.052	.052	.054
		per lb.	.045	.045	.045	.045	.045	.045	.049	.049	.049	.049	.052	.052	.056	.06	.067
" 62½ "		per sq. ft.	.169	.135	.121	.107	.093	.079	.073	.064	.058	.052	.052	.049	.049	.049	.051
		per lb.	.042	.042	.042	.042	.042	.042	.045	.045	.045	.045	.049	.049	.052	.056	.063
" 65 "		per sq. ft.	.157	.126	.113	.1	.087	.073	.068	.06	.054	.048	.049	.046	.046	.045	.047
		per lb.	.039	.039	.039	.039	.039	.039	.042	.042	.042	.042	.045	.045	.049	.052	.058
" 67½ "		per sq. ft.	.146	.117	.105	.093	.081	.068	.063	.056	.050	.045	.045	.043	.043	.042	.044
		per lb.	.036	.036	.036	.036	.036	.036	.039	.039	.039	.039	.042	.042	.045	.048	.054
" 70 "		per sq. ft.	.135	.108	.097	.085	.074	.063	.058	.051	.046	.041	.042	.039	.039	.039	.04
		per lb.	.033	.033	.033	.033	.033	.033	.036	.036	.036	.036	.038	.038	.041	.044	.049
" 72½ "		per sq. ft.	.124	.99	.089	.078	.068	.058	.054	.047	.042	.038	.038	.036	.036	.036	.037
		per lb.	.03	.03	.03	.03	.03	.03	.032	.032	.032	.032	.035	.035	.037	.04	.045
" 75 "		per sq. ft.	.112	.09	.081	.071	.062	.052	.049	.042	.038	.034	.035	.033	.033	.032	.034

SHEET ZINC.

Zinc Gauge.	Stubs' Wire Gauge.	Weight per Sq. Foot.	Approximate Weight per Sheet. 24 x 84	26 x 84	28 x 84	30 x 84	32 x 84	34 x 84	36 x 84	40 x 84
		oz.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
6	29	7	6 1/8	6 5/8	7 1/8	7 5/8	8 1/4	8 3/4	9 1/4	
7	28 1/2	8	7	7 5/8	8 1/8	8 5/8	9 1/8	9 1/2	10 1/4	
8	28	9	7 7/8	8 1/2	9 1/8	9 7/8	10 1/2	11 1/8	11 3/4	
9	27	10 1/2	9 1/4	10	10 3/4	11 1/2	12 1/4	13	13 3/4	
10	26	12	10 1/2	11 1/2	12	13	14	15	16	
11	25	13 1/2	12	13	14	15	16	17	18	
12	24	15	13	14	15	16 1/2	17 1/2	18 1/2	20	
13	23	17	15	16	17	18 1/2	20	21	22	25
14	22	19	17	18	19 1/2	21	22	23 1/2	25	28
15	21	22	19	21	22 1/2	24	25 1/2	27	29	32
16	20	25	22	24	25 1/2	27	29	31	33	36
17	19	28	25	27	29	31	33	35	37	41
18	18	31	27	30 1/2	32	34	36	38	41	45
19	17	35	31	33	36	38	41	44	46	51
20	16	40	35	38	41	44	47	50	53	59

BAR AND SHEET LEAD.

WEIGHT IN POUNDS.

Thickness, or Diameter, or Side; Inches.	Sheets per Square Foot.	Square Bars 1 Foot Long.	Round Bars 1 Foot Long.	Thickness, or Diameter, or Side; Inches.	Sheets per Square Foot.	Square Bars 1 Foot Long.	Round Bars 1 Foot Long.
1/16	3.71	.02	.014	1 1/16	63.2	5.6	4.4
1/8	7.43	.079	.06	1 1/8	66.87	6.26	4.91
3/16	11.	.175	.136	1 3/16	70.51	6.98	5.5
1/4	14.08	.31	.245	1 1/4	74.35	7.74	6.1
5/16	18.05	.486	.38	1 5/16	78.65	8.55	6.73
3/8	22.02	.695	.549	1 3/8	81.76	9.38	7.38
7/16	26.	.948	.745	1 7/16	85.48	10.18	8.05
1/2	29.75	1.25	.975	1 1/2	89.28	11.	8.75
9/16	33.49	1.55	1.24	1 9/16	93.	12.05	9.50
5/8	37.18	1.95	1.51	1 5/8	96.78	13.15	10.25
11/16	40.87	2.33	1.85	1 11/16	100.5	14.15	11.06
3/4	44.58	2.8	2.2	1 3/4	104.1	15.18	11.88
13/16	48.28	3.28	2.58	1 13/16	107.8	16.30	12.76
7/8	52.12	3.8	2.98	1 7/8	112.3	17.45	13.66
15/16	56.05	4.35	3.41	1 15/16	116.	18.10	14.61
1	59.48	4.95	3.9	2	119.6	19.78	15.58

SHEET LEAD IS MADE TO WEIGH, PER SQUARE FOOT:
2½, 3, 3½, 4, 4½, 5, 6, 7, 8, 9, 10 pounds, and upwards.

Weight and Dimensions of Wrought Iron Welded Pipes.

FOR GAS, STEAM AND WATER.

Inside Diameter in inches.	Outside Diameter in inches.	Weight per foot in pounds.	Inside Diameter in inches.	Outside Diameter in inches.	Weight per foot in pounds.
⅛	0.40	0.24	3	3 5	7.54
¼	0.54	0.42	3½	4.0	9.05
⅜	0.67	0.56	4	4.5	10.72
½	0.84	0.85	4½	5.0	12.49
¾	1.05	1.12	5	5.56	14.56
1	1.31	1.67	6	6.62	18.77
1¼	1.66	2.25	7	7.62	23.41
1½	1.95	2.69	8	8.62	28.35
2	2.37	3.66	9	9.68	34.07
2½	2.87	5.77	10	10 75	40.64

Lap Welded American Charcoal Iron Boiler Tubes.

TABLE OF STANDARD SIZES.

External Diameter.	External Circumference.	Internal Diameter.	Internal Circumference.	Thickness.	Length of Pipe per sq. ft. of inside surface.	Length of Pipe per sq. ft. of outside surface.	Internal Area.	External Area.	Weight per foot.
Ins.	Ins.	Ins.	Ins.	Ins.	Feet.	Feet.	Ins.	Ins.	lbs.
1	3.142	0.856	2.689	0 072	4.460	3.819	0.575	0.785	0.708
1⅛	3.927	1.126	3.474	0.072	3.455	3 056	0 960	1.227	0.9
1½	4.712	1.334	4.191	0.083	2.863	2.547	1.396	1.767	1.250
1¾	5.598	1.560	4 901	0.095	2.448	2.183	1.911	2.405	1.665
2	6.283	1.804	5.667	0.098	2.118	1.909	2.556	2. 42	1.981
2¼	7.069	2.054	6.484	0.098	1.850	1.698	3.314	3.976	2.238
2½	7.854	2.283	7.172	0.109	1.673	1.528	4.094	4 939	2.755
2¾	8.639	2.533	7.957	0.109	1.508	1.390	5.039	5.940	3.045
3	9.425	2.783	8.743	0.109	1.373	1.273	6.083	7.069	3.333
3¼	10.210	3.012	9.462	0.119	1.268	1.175	7.125	8.296	3.958
3½	10.995	3.262	10.248	0.119	1.171	1.091	8.357	9.621	4.272
3¾	11.781	3.512	11.033	0.119	1.088	1.018	9.687	11.045	4 590
4	12.566	3.741	11.753	0.130	1.023	0.955	10.992	12.566	5.320
4½	14.137	4.241	13.323	0.130	0.901	0.849	14.126	15.904	6.010
5	15.708	4.72	14.818	0.140	0.809	0.764	17.497	19.635	7.226
6	18.849	5.699	17.904	0 151	0.670	0.637	25.509	28.274	9.346
7	21.991	6.657	20.914	0 172	0.574	0.545	34.805	38.484	12.435
8	25.132	7.636	23.989	0.182	0.500	0.478	45.795	50.265	15.109
9	28.374	8.615	27.055	0.193	0.444	0.424	58.291	63.617	18.002
10	31.416	9.573	30.074	0.214	0.399	0.382	71.975	78.540	22.19

Light Wrought Iron Artesian Tube and Casing for Oil Wells.

STANDARD SIZES.

Outside Diameter in inches.	Inside Diameter in inches.	Weight per Foot, Pounds.	Outside Diameter, Inches.	Inside Diameter, Inches.	Weight per Foot, Pounds.
1¾	1½	1 665	4¼	4	5.500
2⅛	2	2.238	4½	4¼	6.010
2⅜	2⅛	2.755	5	4¾	7.226
2¾	2½	3.045	5¼	5	7.667
3	2¾	3.333	5½	5 3-16	8.083
3¼	3	3.958	6	5⅝	9.346
3½	3¼	4.272	6½	6¼	10 064
3¾	3½	4.950	7	6⅝	12.435
4	3¾	5.320	8	7⅝	15.109
			8⅛	8¼	16.155

LAG OR WOOD SCREWS.

Weight of 100, in Pounds.

Diamet'r	5/16	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1
Length.									
1½	4.7	7.1	9.9	13.9					
1¾	5.2	7.6	10.9	14.9					
2	5.7	8.1	11.6	15.8	24.	26.2			
2¼	6.2	8.7	12.5	16.9	25.	27.7			
2½	6.7	9.3	13.4	17.9	26.	29.2	46.5		
3	7.7	10.6	15.1	19.9	28.	33.5	51.5	73.	
3½	8.7	11.9	16.5	22.	31.	36.5	56.5	79.	103.
4	9.7	13.3	18.6	24.3	34.	39.5	61.5	85.	112.
4½	10.7	14.7	20.4	26.9	37.	42.2	67.	91.	121.
5	11.7	16.1	22.1	29.	40.	46.	72.2	97.	130.
5½	12.7	17.5	23.8	31.5	43.	49.4	78.	103.	140.
6	13.7	18.9	25.5	34.	46.	53.	83.5	110.	150.
7			29.2	39.	52.	60.	94.	125.	170.
8			33.	44.	58.	67.5	104.5	140.	190.
9				49.	64.	75.	115.	156.	210.
10				54.	70.	82.5	126.	172.	230.
11					76.	90.	137.	188.	250.
12					82.	98.	148.	204.	270.

GEOMETRICAL DEFINITIONS.

Angle—An opening between two lines that meet in a point.
Right Angle—A straight line perpendicular to another.
Obtuse Angle—An angle wider than a right angle.
Acute Angle—An angle less than a right angle.
Triangle—A figure with three sides and three angles.
Equilateral Triangle—A triangle having all sides equal.
Isosceles Triangle—A triangle having two of its sides equal.
Right-Angled Triangle—A triangle having one right angle.
Obtuse-Angled Triangle—A triangle having one obtuse angle.
Quadrangle or Quadrilateral is a four-sided figure and may be a parallelogram, having its opposite sides paralleled.
Square—Having all its sides equal and all right angles.
Rectangle—Having a right angle.
Rhombus or Lozenge—Having all sides equal and no right angles.
Rhomboid—A parallelogram with no right angles.
Trapezoid—Having only two sides parallel.
Polygon—A plain figure having more than four sides.
Pentagon—Having five sides.
Hexagon—Having six sides.
Heptagon—Having seven sides.
Octagon—Having eight sides.
Nonagon—Having nine sides.
Decagon—Having ten sides.
Radius is a line extending from the center to the circumference. It is one-half of any given diameter.

MACHINE BOLTS

With Square Heads and Nuts.

Weight of 100, in Pounds.

Diamet'r	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1
Length.										
1 1/2	4.	7.	10.5	15.2	22.5	30.	39.5			
1 3/4	4.3	7.5	11.2	16.3	23.8	31.7	41.6			
2	4.7	8.	12.	17.4	25.1	33.5	43.7	69.	108.	
2 1/4	5.1	8.5	12.7	18.5	26.4	35.2	45.8	72.	112.2	
2 1/2	5.5	9.	13.5	19.6	27.8	37.	48.	75.	116.5	175
2 3/4	5.7	9.5	14.2	20.7	29.1	38.7	50.1	78.	121.7	180
3	6.2	10.	15.	21.8	30.4	40.5	52.2	81.	126.	185
3 1/2	7.	11.	16.5	24.	33.1	44.	56.5	87.	134.2	196
4	7.7	12.	18.	26.2	35.7	47.5	60.7	93.1	142.5	207
4 1/2	8.5	13.	19.5	28.4	38.4	51.	65.	99.	151.	218
5	9.2	14.	21.	30.6	41.	54.5	69.2	105.2	159.5	229
5 1/2	10.	15.	22.5	32.8	43.7	58.	73.5	111.2	168.	240
6	10.7	16.	24.	35.	46.3	61.5	77.7	117.3	176.6	251
6 1/2	11.5	17.	25.5	37.2	49.	65.	82.	123.3	185.	262
7	12.2	18.	27.	39.4	51.6	68.5	86.2	129.4	193.6	273
7 1/2	13.	19.2	28.5	41.6	54.3	72.	90.5	135.	202.	284
8	13.7	20.7	30.	43.8	59.6	75.5	94.7	141.5	210.7	295
9			34.	48.2	64.9	82.5	103.2	153.6	227.7	317
10			37.5	52.6	70.2	89.5	111.7	165.7	244.8	339
11			41.	57.	75.5	96.5	120.2	177.8	261.8	360
12			44.5	61.4	80.8	103.5	128.7	189.9	278.9	382
13					86.1	110.5	137.2	202.	295.9	404
14					91.4	117.5	145.7	214.1	313.	426
15					96.7	124.5	154.2	226.2	330.	448
16					102.	131.5	162.7	238.3	347.1	470
17					107.3	138.5	171.	250.4	364.1	492
18					112.6	145.5	179.5	262.6	381.2	514
19					117.9	152.5	188.	274.7	398.2	536
20					123.2	159.5	196.5	286.8	415.3	558

WEIGHT OF 100 BOLT ENDS.

IN POUNDS.

5/16 x 8	18 lbs.	5/8 x12	115 lbs.	1 1/8 x13	460 lbs.	1 5/8 x17	1350 lbs.
3/8 x10	34 lbs.	3/4 x12	165 lbs.	1 1/4 x14	630 lbs.	1 3/4 x18	1680 lbs.
7/16 x10	42 lbs.	7/8 x12	230 lbs.	1 3/8 x15	850 lbs.	1 7/8 x19	1900 lbs.
1/2 x12	71 lbs.	1 x12	310 lbs.	1 1/2 x16	1075 lbs.	2 x20	2300 lbs.

Rails, Splices and Bolts Required for One Mile of Track.

Tons of Rails.

Rule—To find the number of tons (of 2,240 lbs.) of Rail to the mile, divide the weight per yard by 7, and multiply it by 11, thus: for 56 lb. rail divide 56 by 7, equal 8, multiplied by 11, equal 88 tons, for one mile of single track.

Weight of Rail, per yard.	Tons per Mile.	Weight of Rail, per yard.	Tons per Mile.
12 pounds.	12 tons 920 pounds.	45 pounds.	70 tons 1600 p'nds.
14 "	22 " "	48 "	75 " 960 "
16 "	25 " 320 "	50 "	78 " 1280 "
18 "	28 " 640 "	52 "	81 " 1600 "
20 "	31 " 960 "	56 "	88 "
22 "	34 " 1280 "	57 "	89 " 1280 "
25 "	39 " 640 "	60 "	94 " 640 "
26 "	40 " 1920 "	62 "	37 " 960 "
27 "	42 " 960 "	64 "	100 " 1280 "
28 "	44 "	65 "	102 " 320 "
30 "	47 " 320 "	68 "	106 " 1920 "
33 "	51 " 1920 "	70 "	110 "
35 "	55 "	72 "	113 " 320 "
40 "	62 " 1920 "	76 "	119 " 960 "

Number of Rails, Chairs, Joints, Splices and Bolts.

Length of Rail.	No. of Rails, Chairs or Joints.	No. of Splices.	No. of Bolts.
18	584	1,168	2,336
20	528	1,056	2,112
21	503	1,006	2,012
22	480	960	1,920
24	440	880	1,760
25	422	844	1,688
26	406	812	1,624
27	391	782	1,564
28	377	754	1,508
30	352	704	1,408

No allowance made for side track in above tables.

Number of Cross Ties for each Mile of Track.

Centre to Centre.	No. of Ties.	Centre to Centre.	No. of Ties
1½ feet.....	3,520	2½ feet.....	2,113
1¾ "	3,017	2¾ "	1,921
2 "	2,640	3 "	1,761
2¼ "	2,348		

Capacity of a Freight Car.

A load is nominally 10 tons of 20,000 lbs. The following can be carried: Whiskey, 60 bbls.; salt, 70 bbls.; lime, 70 bbls.; flour, 90 bbls.; eggs, 130 to 160 bbls.; flour 200 sacks; wood, 6 cords; cattle, 18 to 20 head; hogs, 50 to 60; sheep, 80 to 100; lumber, 6,000 feet; barley, 300 bushels, wheat, 340 bushels; flax seed, 360 bushels; apples, 370 bushels; corn, 400 bushels; potatoes, 430 bushels; oats, 680 bushels; bran, 1,000 bushels; butter, 20,000 lbs.

Weight of a Lineal Foot of Flat Steel in lbs.

Inch.	⅛	¼	⅜	½	⅝	¾	1
⅛	.213	.426	.64	...	...	...	..
3/16	.266	.533	.8	1.066	...	...	...
¼	.319	.639	.959	1.28	1.6	...	...
1	.426	.853	1.28	1.706	2.133	2.559	...
1⅛	.48	.959	1.439	1 919	2.399	2.879	3.84
1¼	.533	1.066	1.6	2.133	2.666	3.200	4.266
1⅜	.586	1.173	1.759	2.346	2.933	3.519	4 693
1½	.639	1.279	1.919	2.56	3.199	3.84	5.119
1⅝	.693	1.386	2.079	2.773	3.466	4.16	5.546
1¾	.746	1.493	2.24	2.986	3.733	4.479	5.973
2	.853	1.706	2.559	3.413	4.266	5.119	6.826
2⅛	.906	1.813	2.719	3.626	4.533	5.439	7.253
2¼	.96	1.919	2.879	3.84	4.799	5.76	7.68
2⅜	1.013	2.026	3.039	4.053	5.066	6.079	8.106
2½	1.016	2.133	3.199	4.266	5.333	6.399	8.533
2⅝	1.019	2.24	3.36	4.48	5.6	6.72	8.96
2¾	1.173	2.346	3.519	4.693	5.866	7.039	9.386
3	1.28	2.56	3.84	5.12	6.4	7.68	10.24
3¼	1.386	2.773	4.16	5.546	6.933	8.319	11.093
3½	1.493	2.986	4.48	5.973	7.466	8.95	11.946
3¾	1.6	3.199	4.799	6.399	7.999	9.599	12.799
4	1.706	3.413	5.119	6.826	8.533	10.239	13.653
4¼	1.813	3.626	5.439	7.253	9.066	10.879	14.506
4½	1.92	3.84	5.76	7.68	9.6	11.52	15.36
4¾	2.026	4.053	6.079	8.106	10.133	12.159	16.213
5	2.133	4.266	6.399	8.533	10.666	12.799	17.066
5¼	2.24	4.48	6.72	8.959	11.199	13.44	17.919
5½	2.346	4.693	7.039	9.386	11.733	14.079	18.773
5¾	2.453	4.906	7.359	9.813	12.266	14.719	19.626
6	2.56	5.12	7.68	10.24	12.8	15.36	20.48

Number of Brass Escutcheon Pins in a Pound.

	¼	⅜	½	⅝	¾	⅞	1	1¼	1½	1¾	2
12	.....	720	650	460	416	400	336	272	212	192	176
13	.....	1,120	948	672	528	480	400	380	320	229	220
14	1,875	1,312	1,100	950	830	692	600	432	378	320	272
15	2,440	1,820	1,376	1,152	960	888	720	576	580	432	400
16	3,100	2,240	1,720	1,460	1,275	1,130	980	720	592	578	464
17	3,540	2,700	2,076	1,812	1,500	1,185	1,051	928	800	640	.....
18	4,972	3,175	2,550	2,450	2,200	1,740	1,520	1,216	960	.....	.....
19	7,303	5,140	4,130	3,565	2,900	.....	.....	.....	.....	.....	.....
20	9,932	8,419	6,374	5,500	4,155	.....	.....	.....	.....	.....	.....

WEIGHT OF ONE FOOT OF BAR STEEL.

ROUND.		SQUARE.		OCTAGON.	
Diam. In.	Lbs.	Side In.	Lbs.	Diam. In.	Lbs.
¼	.166	¼	.213	¼	.84
⅜	.375	⅜	.479	⅝	1.23
½	.667	½	.855	¾	1.75
⅝	1.04	⅝	1.33	⅞	2.25
¾	1.50	¾	1.91	1	2.75
⅞	2.05	⅞	2.61	1⅛	3.66
1	2.67	1	3.40	1¼	4.65
1⅛	3.38	1⅛	4.34	1⅜	5.50
1¼	4.17	1¼	5.32	1½	6.45
1⅜	5.05	1⅜	6.44	1⅝	7.75
1½	6.00	1½	7.67	1¾	9.20
1⅝	7.05	1⅝	9.00	1⅞	10.04
1¾	8.17	1¾	10.44	2	11.60
1⅞	9.38	1⅞	11.98	2⅛	13.14
2	10.68	2	13.63	2¼	14.75
2⅛	12 04	2⅛	15.35	2⅜	16.40
2¼	13.51	2¼	17.20	2½	17.85
2⅜	15.05	2⅜	19.17	2⅝	19.50
2½	16.68	2½	21.20	2¾	21.25
2⅝	18.43	2⅝	23.50	2⅞	22.69
2¾	20.19	2¾	25.70	3	25.00
2⅞	22.00	2⅞	27.74		
3	24.03	3	30.00		
3⅛	26.12	3⅛	33.18		
3¼	28.20	3⅛	35.90		
3⅜	30.45	3⅜	38.78		
3½	32 70	3½	41.65		
3⅝	35.12	3⅝	44.17		
3¾	37.54	3¾	46.70		
4	42.71	4	54.40		
4¼	48.22	4¼	61.40		
4½	54.06	4½	68.85		
5	66.75	5	85.00		

GENUINE RUSSIA SHEET IRON.

	SIZE.	WEIGHT PER SHEET.	WIRE GAUGE.
No. 7..	28x56 in.	6¼ lbs.	No. 29
No. 8	"	7¼ lbs.	No. 28
No. 9	"	8 lbs.	No. 27
No. 10	"	9 lbs.	No. 26
No. 11	"	10 lbs.	No. 25
No. 12	"	10¾ lbs.	No. 24½
No. 13	"	11¾ lbs.	No. 24
No. 14	"	12½ lbs.	No. 23¼
No. 15	"	13½ lbs.	No. 22⅝
No. 16	"	14½ lbs.	No. 21½

Average weight per bundle, 240 pounds.

AMERICAN (IMITATION) RUSSIA SHEET IRON.

No. Wire Gauge.	Size sheets—inches.	Wt. per sheet, lbs.
24	28x60	11½
25	28x60	10½
26	28x60	9¾
27	28x60	9¼

Tempering Steel.

(Haswell.)

Steel in its hardest state being too brittle for most purposes, the requisite strength and elasticity are obtained by tempering—or *letting down the temper* as it is termed—which is performed by heating the hardened steel to a certain degree and cooling it quickly. The requisite heat is usually ascertained by the color which the surface of the Steel assumes from the film of oxide thus formed.

The degrees of heat to which these several colors correspond are as follows:

At 430, a very faint yellow.	Suitable for hard instruments; as hammer-faces, drills, &c.
At 450, a pale straw color..	
At 470, a full yellow.....	For instruments requiring hard edges without elasticity; as shears, scissors, turning tools, &c
At 490, a brown color.....	
At 510, brown, with purple spots.....	For tools, for cutting wood and soft metals; such as plane-irons, knives, &c.
At 530, purple.....	
As 550, dark blue.....	For tools requiring strong edges, without extreme hardness; as cold-chisels, axes, cutlery, &c.
At 560, full blue.....	
At 600, grayish blue, verging on black.....	For spring-temper, which will bend before breaking; as saws, sword-blades, &c.

If the steel is heated higher than this, the effect of the hardening process is destroyed.

It Has Been Stated

That the temperature of furnaces &c., may be estimated with considerable accuracy by the color of the fire, and that with a little practice the error at very high temperatures will not exceed 90°, or 100°, and the following table contains the result of observations with an air thermometer.

Color of Fire.	Temperature, Degrees F.
Red, just visible.....	977
" dull.....	1,290
" cherry, dull.....	1,470
" " full.....	1,650
" " clear.....	1,830
Orange, deep.....	2,010
" clear.....	2,190
White heat.....	2,370
" bright.....	2,550
" dazzling.....	2,730

Effect of Heat on Various Bodies.

	Degrees
Ammonia boils.....	140
Ammonia (liquid) freezes.....	—46
Antimony melts.....	951
Arsenic melts.....	365
Bismuth melts.....	476
Blood (human) heat of.....	98
" " freezes.....	25
Brandy freezes.....	—7
Brass melts.....	1,900
Cadmium melts.....	600
Coal Tar boils.....	325
Cold, greatest artificial.....	—166
" greatest natural.....	—56
Common Fire.....	790
Copper melts.....	2,548
Glass melts.....	2,377
Gold (fine) melts.....	2,590
Gutta-percha softens.....	145
Heat, cherry red.....	1,500
" " (Daniel).....	1,141
" bright red.....	1,860
" red, visible by day.....	1,077
" white.....	2,900
Ice melts.....	32
Iron (cast) melts.....	3,479
" (wrought) melts.....	3,980
Iron, bright red in the dark...	752
" red hot in twilight.....	884
Lead melts.....	504
Mercury boils.....	662
" volatilizes.....	680
" freezes.....	—39
Naphtha boils.....	186
Petroleum boils.....	306
Platinum melts.....	3,080
Potassium melts.....	135
Proof Spirit freezes.....	—7
Saltpetre melts.....	600
Sea-water freezes.....	28
Silver (fine) melts.....	1,250
Snow and Salt, equal parts.	0
Spirits of Terpentine freezes.	14
Steel melts.....	2,500
" polished, blue.....	580
" " straw color.....	460
Strong Wines freeze.....	20
Sulphur melts.....	226
SulphAcid(sp.grav1,641)freezes	—45
Tin melts.....	421
Vinous fermentation.....60 to	77
Water in *vacuo* boils.....	98
Zinc melts.....	740

The sign — before the figures indicates that many degrees below zero or 0.

BUILDERS' REFERENCE TABLES.

Size of Glass in Windows.			Size of Sash and Frame.	Weights.	
12 Lights.	8 Lights.	4 Lights.		1¼	1½
				Lbs.	Lbs.
8x10	12 x10	12 x20	2.4 x3.10	4	5
8x12	12 x12	12 x24	2.4 x4.6	4½	5
9x12	13½x12	13½x24	2.7 x4.6	5	5½
9x13	13½x13	13½x26	2.7 x4.10	5½	5½
9x14	13½x14	13½x28	2.7 x5.2	5½	6
9x15	13½x15	13½x30	2.7 x5.6	5½	6½
9x16	13½x16	13½x32	2.7 x5.10	6	6½
10x12	15 x12	15 x24	2.10x4.6	5½	6
10x14	15 x14	15 x28	2.10x5.2	6	6½
10x15	15 x15	15 x30	2.10x5.6	6	7
10x16	15 x16	15 x32	2.10x5.10	6½	7½
10x18	15 x18	15 x36	2.10x6.6	7	8
10x20	15 x20	15 x40	2.10x7.2	8	9
11x14	16½x14	16½x28	3.1 x5.2	6	7
11x15	16½x15	16½x30	3.1 x5.6	6½	7½
11x16	16½x16	16½x32	3.1 x5.10	7	8
11x17	16½x17	16½x34	3.1 x6.2	7	8
11x18	16½x18	16½x36	3.1 x6.6	7½	8½
12x14	18 x14	18 x28	3.4 x5.2	6½	7½
12x15	18 x15	18 x30	3.4 x5.6	7	8
12x16	18 x16	18 x32	3.4 x5.10	7½	8½
12x18	18 x18	18 x36	3.4 x6.6		9½
12x20	18 x20	18 x40	3.4 x7.2		10½
12x24	18 x24	18 x48	3.4 x8.6		12

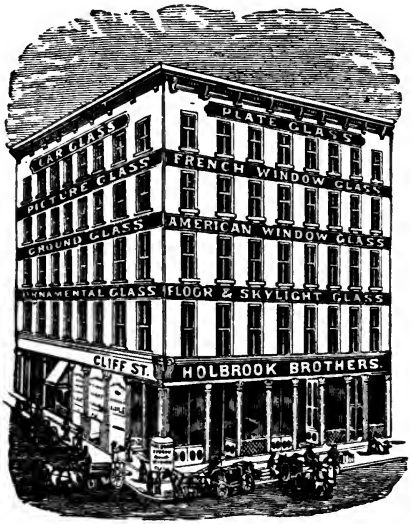
One Hank of Sash Cord will hang 16 Weights. Each Hank Measures 75 feet and weighs about 2 1-4 lbs.

SASH WEIGHTS.—Standard Size List.

Lbs.	Inches diam'r	Inches length	Lbs.	Inches diam'r	Inches length	Lbs.	Inches diam'r	Inches length
2	1 1/8	8¼	9	1 9/16	18	18	1⅞	25½
2½	1 1/8	10	9½	1 9/16	19½	19	2	24½
3	1 5/16	11	10	1 5/8	19	20	2	25½
3½	1 5/16	11	10½	1 5/8	19¾	21	2	27½
4	1 5/16	12	11	1 5/8	20⅜	22	2	28
4½	1 5/16	13	11½	1 5/8	19	23	2	30
5	1 7/16	13	12	1 5/8	20	24	2	31
5½	1 7/16	14	12½	1 5/8	21	25	2	32
6	1 7/16	14½	13	1 5/8	22	26	2	33
6½	1 7/16	15¼	14	1 5/8	23½	27	2	35
7	1 7/16	16¼	15	1 5/8	25	28	2	37
7½	1 ½	17	16	1 7/8	23¼	29	2	38
8	1 ½	17¾	17	1 7/8	24½	30	2	39½
8½	1 9/16	17¾						

2-lb. to 20-lb. Patent Eye. 21-lb. to 30-lb. Solid Eye.
Sizes not on List, and Square Weights, half-cent per lb. extra.

WINDOW GLASS.



IMPORTERS —

ENGLISH and FRENCH PLATE GLASS,
FRENCH WINDOW GLASS.
FRENCH PICTURE GLASS.
FRENCH CAR GLASS.
ENAMELED GLASS,
GROUND GLASS,
CATHEDRAL GLASS.
RUBY, BLUE, GREEN, ORANGE and PURPLE GLASS.

SHARRATT & NEWTH'S ENGLISH GLAZIERS' DIAMONDS.

—ALSO—

American Plate Glass. *American Window Glass.*
Floor and Skylight Glass. *Embossed and Cut Glass.*

All kinds of Glass Cut to any Size and Shape required. Estimates furnished.

HOLBROOK BROTHERS,

87 & 89 Beekman, and 53 & 55 Cliff Streets,

NEW YORK CITY.

WINDOW GLASS.

FRENCH OR AMERICAN.

No. of Lights per Box of 50 Feet.

6	by 8	150	13	by 20	28	16	by 54	8	24	by 30	10	32	by 36	6
6½	" 8½	130	13	" 22	25	16	" 60	8	24	" 32	10	32	" 38	6
7	" 9	115	13	" 24	23	18	" 20	20	24	" 34	9	32	" 40	6
8	" 10	90	13	" 26	21	18	" 20	18	24	" 36	9	32	" 42	6
8½	" 10½	81	13	" 28	20	18	" 24	17	24	" 38	8	32	" 44	5
8	" 11	82	13	" 30	19	18	" 26	16	24	" 40	8	32	" 48	5
8	" 12	75	13	" 32	17	18	" 28	14	24	" 42	7	32	" 50	5
9	" 11	73	14	" 15	34	18	" 30	14	24	" 46	7	32	" 56	4
9	" 12	67	14	" 16	32	18	" 32	13	24	" 48	6	32	" 60	4
9	" 13	62	14	" 17	31	18	" 34	12	24	" 50	6	32	" 66	3
9	" 14	57	14	" 18	29	18	" 36	11	24	" 54	6	34	" 36	6
9	" 15	53	14	" 20	26	18	" 38	11	24	" 56	5	34	" 40	6
9	" 16	50	14	" 22	24	18	" 40	10	24	" 60	5	34	" 44	5
9	" 18	45	14	" 24	22	18	" 42	10	24	" 66	5	34	" 46	5
10	" 12	60	14	" 26	20	18	" 44	9	26	" 28	10	34	" 48	5
10	" 13	55	14	" 28	19	18	" 46	9	26	" 30	9	34	" 50	4
10	" 14	52	14	" 30	17	18	" 50	8	26	" 32	9	34	" 54	4
10	" 15	48	14	" 32	16	18	" 52	8	26	" 34	8	34	" 56	4
10	" 16	45	14	" 34	15	18	" 56	7	26	" 36	8	34	" 60	4
10	" 17	43	14	" 36	14	18	" 60	7	26	" 38	7	34	" 66	3
10	" 18	40	14	" 38	14	20	" 22	16	26	" 42	7	36	" 40	5
10	" 20	36	14	" 40	13	20	" 24	15	26	" 44	6	36	" 44	5
10	" 22	33	14	" 42	12	20	" 26	14	26	" 48	6	36	" 46	4
10	" 24	30	14	" 44	12	20	" 28	13	26	" 50	6	36	" 48	4
10	" 26	28	14	" 46	11	20	" 30	12	26	" 52	5	36	" 50	4
10	" 28	26	15	" 16	30	20	" 32	11	26	" 54	5	36	" 54	4
10	" 30	24	15	" 18	27	20	" 34	11	26	" 58	5	36	" 56	4
11	" 12	55	15	" 20	24	20	" 36	10	26	" 60	5	36	" 60	3
11	" 13	51	15	" 22	22	20	" 38	10	28	" 30	9	36	" 64	3
11	" 14	47	15	" 24	20	20	" 40	9	28	" 32	8	36	" 66	3
11	" 15	44	15	" 26	19	20	" 42	9	28	" 34	8	36	" 70	3
11	" 16	41	15	" 28	17	20	" 44	8	28	" 36	7	38	" 40	5
11	" 17	39	15	" 30	16	20	" 48	8	28	" 40	7	38	" 42	5
11	" 18	37	15	" 32	15	20	" 50	7	28	" 42	6	38	" 44	4
11	" 20	33	15	" 34	14	20	" 54	7	28	" 46	6	38	" 52	4
11	" 22	30	15	" 36	13	20	" 58	6	28	" 50	5	38	" 56	3
11	" 24	27	15	" 38	13	20	" 64	6	28	" 56	5	38	" 62	3
12	" 13	46	15	" 40	12	22	" 24	14	28	" 60	4	38	" 66	3
12	" 14	43	16	" 16	28	22	" 26	13	28	" 66	4	40	" 40	4
12	" 15	40	16	" 18	25	22	" 28	12	30	" 30	8	40	" 42	4
12	" 16	38	16	" 20	23	22	" 30	11	30	" 32	8	40	" 44	4
12	" 17	35	16	" 22	21	22	" 32	10	30	" 34	7	40	" 50	4
12	" 18	34	16	" 24	19	22	" 34	10	30	" 38	7	40	" 54	3
12	" 20	30	16	" 26	17	22	" 36	9	30	" 40	6	40	" 60	3
12	" 22	27	16	" 28	16	22	" 38	9	30	" 44	6	40	" 66	3
12	" 24	25	16	" 30	15	22	" 40	8	30	" 46	5	40	" 72	3
12	" 26	23	16	" 32	14	22	" 42	8	30	" 48	5	42	" 42	4
12	" 28	22	16	" 34	13	22	" 44	7	30	" 50	5	42	" 48	4
12	" 30	20	16	" 36	13	22	" 48	7	30	" 52	5	42	" 52	3
12	" 32	19	16	" 38	12	22	" 50	7	30	" 54	4	42	" 62	3
12	" 34	18	16	" 40	11	22	" 52	6	30	" 56	4	42	" 68	3
12	" 36	17	16	" 42	11	22	" 56	6	30	" 60	4	44	" 46	4
13	" 14	40	16	" 44	10	22	" 60	5	30	" 64	4	44	" 50	3
13	" 15	37	16	" 46	10	24	" 24	12	30	" 66	4	44	" 56	3
13	" 16	35	16	" 48	9	24	" 26	12	30	" 70	3	46	" 54	3
13	" 18	31	16	" 52	9	24	" 28	11	32	" 34	7	46	" 64	3

ROOFING SLATE.

GENERAL RULE FOR THE COMPUTATION OF SLATE.

From the length of the slate take three inches, or as many as the third covers the first; divide the remainder by 2, and multiply the quotient by the width of the slate, and the product will be the number of square inches in a single slate. Divide the number of square inches thus procured by 144, the number of square inches in a square foot, and the quotient will be the number of feet and inches required. A square of slate is what will cover 100 feet square, when properly laid upon the roof.

TABLE OF SIZES AND NUMBER OF SLATES IN ONE SQUARE.

Size in Inches.	No. of Slate in a Square.	Size in Inches.	No. of Slate in a Square.	Size in Inches	No. of Slate in a Square.	Size in Inches.	No. of Slate in a Square.
6x12	533	9x14	291	10x18	192	11x22	137
7x12	457	10x14	261	11x18	174	12x22	126
8x12	400	12x14	218	12x18	160	14x22	108
9x12	355	8x16	277	14x18	137	12x24	114
10x12	320	9x16	246	10x20	139	14x24	98
12x12	2?6	10x16	221	11x20	154	16x24	85
7x14	374	12x16	185	12x20	111	14x26	89
8x14	3 7	9x18	213	14x20	121	16x26	78

The weight of a square of Slate is estimated in a general way (varying according to the thickness of the different makes) at from 600 to 700 lbs. per square.

A *square* of Slate is 100 superficial feet.

Gauge is distance between the courses of the slates.

Lap is distance which each slate overlaps the slate lengthwise next but one below it, and it varies from 2 to 4 inches. The standard is assumed to be 3 inches.

Margin is width of course exposed or distance between tails of slate.

Pitch of a slate roof should not be less than 1 in height to 4 in breadth.

Length of a slate is taken from nail-hole to tail.

Thickness of slates ranges from $\frac{1}{8}$ to $\frac{5}{16}$ inch.

WEIGHT PER SQUARE FOOT.

Thickness.....	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	1
Weight.....	1.81	2.71	3.62	5.43	7.25	9.06	10.87	14.5 lbs.

Weight per cubic foot, 174 pounds.

It requires, on account of laps, an average of nearly $2\frac{1}{2}$ *square feet* of slate to make one of slating.

GARDEN CITY
Fire Engine House
◆SPRING HINGE◆

Especially constructed for the purpose of *Throwing the Doors Open.* Made very heavy, and with a powerful spring.

FRONT DOOR SIZE, 18 INCHES LONG.

We refer, by permission, to the *Fire Marshal of the Chicago Fire Department* as to the merits of this Hinge.

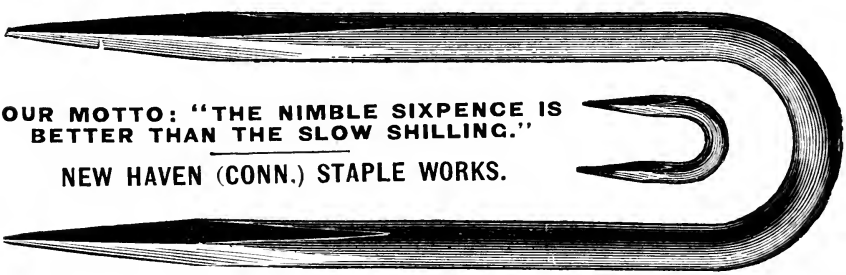
	9	39	49	59
	Japanned, per pair.	Bronze Plated, per pair,	Real Bronze, per pair.	Brass, per pair.
Stall Doors.....	$3 00	$7 00	$13 00	$13 00
Front Doors....	5 00	8 50	19 00	19 00
Extra Heavy Front Doors.	7 00	11 00	25 00	25 00

MANUFACTURED BY

Chicago Spring Butt Co.

CHICAGO, ILL.

Eastern Office, 97 Chambers St., N. Y.



OUR MOTTO: "THE NIMBLE SIXPENCE IS BETTER THAN THE SLOW SHILLING."

NEW HAVEN (CONN.) STAPLE WORKS.

Number of Slate in any Number of Squares

CAN BE CALCULATED FROM THE FOLLOWING TABLE.

The left-hand column is size of slate; the figures at the top are the number of squares; the columns of figures are the number of pieces of slate.

	½ SQ.	1 SQ.	2 SQ.	3 SQ.	4 SQ.	5 SQ.	6 SQ.	7 SQ.	8 SQ.	9 SQ.	10 SQ.	11 SQ.	12 SQ.	13 SQ.	14 SQ.
24x16	43	85	171	258	343	428	515	600	685	772	857	943	1029	1115	1200
24x14	49	98	196	294	392	490	588	686	783	881	979	1077	1175	1273	1371
24x12	58	115	229	343	457	571	686	800	914	1029	1143	1257	1371	1485	1600
22x14	54	108	217	325	434	542	650	758	866	975	1083	1191	1300	1408	1516
22x12	63	126	253	379	505	631	758	884	1011	1137	1263	1389	1515	1642	1768
22x11	69	137	276	413	551	689	826	965	1102	1240	1378	1515	1653	1791	1929
20x14	61	121	242	363	484	605	726	847	968	1089	1210	1331	1452	1573	1694
20x12	71	141	282	424	565	706	847	988	1129	1271	1412	1552	1694	1835	1976
20x11	77	154	308	462	616	770	924	1078	1232	1386	1540	1694	1848	2002	2156
20x10	85	170	339	508	678	847	1017	1186	1356	1525	1694	1863	2032	2202	2371
18x12	80	160	320	480	640	800	960	1120	1280	1440	1600	1760	1920	2080	2240
18x10	96	192	384	576	768	960	1152	1344	1536	1728	1920	2112	2304	2496	2688
18x 9	107	213	426	640	853	1066	1280	1493	1706	1920	2133	2346	2560	2773	2986
10x12	93	185	370	554	739	924	1108	1293	1477	1662	1847	2031	2216	2400	2585
10x10	111	222	443	664	886	1107	1329	1550	1772	1993	2215	2436	2658	2880	3101
10x 9	123	246	492	738	985	1231	1477	1723	1969	2215	2461	2707	2953	3200	3446
10x 8	138	276	554	831	1108	1385	1662	1938	2215	2492	2769	3046	3323	3600	3876
14x14	94	187	374	561	748	935	1122	1309	1496	1683	1870	2057	2244	2431	2618
14x12	109	218	437	654	872	1091	1310	1527	1745	1963	2182	2400	2618	2836	3054
14x10	131	262	524	785	1048	1309	1570	1833	2094	2356	2618	2880	3141	2403	3665
14x 9	145	290	581	872	1163	1454	1745	2036	2326	2618	2909	3200	3490	3781	4072
14x 8	164	327	655	982	1309	1636	1964	2291	2618	2946	3273	3600	3927	4254	4581
14x 7	187	374	748	1122	1496	1870	2244	2618	2992	3366	3740	4114	4488	4862	5236
12x12	134	267	534	800	1067	1334	1600	1867	2133	2400	2667	2934	3200	3467	3734
12x10	160	320	640	960	1280	1600	1920	2240	2559	2879	3200	3520	3840	4160	4480
12x 8	200	400	800	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800	5200	5600
12x 7	229	457	914	1371	1828	2285	2743	3200	3657	4114	4571	5028	5485	5942	6399
12x 6	267	533	1067	1600	2134	2667	3200	3734	4267	4800	5334	5867	6400	6934	7437

Standard Rules for Measuring Slate Roofing.

These rules are recognized and followed by roofers and architects wherever slate-roofing is used, and in all standard works on the subject: FOR PLAIN ROOF—Measure the length of the roof and multiply by the length of the rafter. FOR ROOF WITH HIPS, VALLEYS, GABLES, DORMERS, ETC.—Measure each section through center and multiply length of rafter; and, in addition to the actual surface of roof, measure the length of all hips and valleys by one foot wide. The extra measure on hips and valleys is intended to compensate for extra labor and loss of material in cutting, fitting and laying same. No deduction is made for dormer windows, skylights, chimneys, etc., unless they measure more than four feet square. If more than four feet square and less than eight feet square, deduct one-half. If more than eight feet square, deduct the whole. If hips are mitred, charge extra. The carpenter should furnish cant strips.

SPRINGS

Cliff's R. H. Wagon Bolster Springs

ARE THE BEST IN THE WORLD.

They are made of *Best Crucible Steel.*

They are *All Complete,* ready to drop onto the wagon.

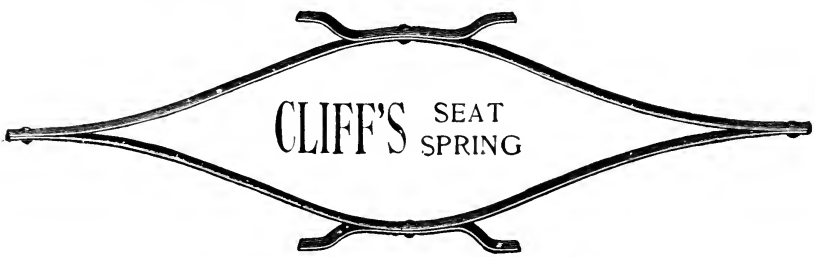
They are *Adjustable to any Width* of Bolster.

They have the *Slow, Easy Motion* that is absolutely necessary to carry fruits and produce in perfect condition.

They *Will Save 20 Per Cent.* in wear and tear on wagon and team.

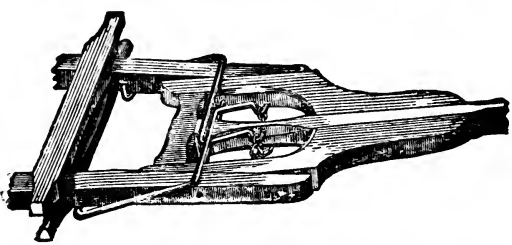
Every set of Springs will carry its marked capacity.

Springs are *Warranted Against Defects* of material and workmanship.



TRY the Cliff Seat Spring JUST ONCE and you will be surprised at the demand for them. They are a Better Spring than you have been able to get FOR THE MONEY.

T. & B. WAGON POLE SPRING.



The *Best WAGON POLE SPRING* in the market. Can be put on or taken off in one minute.

For *Durability, Ease of Adjustment* and *Capacity* to do the work *Right,* it leads them all. Try them.

Write for Prices.

TITUS & BABCOCK, Rochester, N. Y.

POWDER AND SAFETY FUSE.

SPORTING POWDER is packed in 5 sizes of grain running from F (coarsest), FF, FG, FFG, FFFG (finest), the sizes in greatest demand being FG and FFG.

BLASTING POWDER.—"*A Blasting*" is packed in 8 sizes of grain, TP (coarsest), TPG, F, FF, FG, FFG, FFFG, FFFFG (finest), the last size being especially adapted for use in Granite quarries.

"*B Blasting*" has 6 sizes of grain, C (coarsest), TP, TPG, F, FF, FFF (finest). It is *glazed* unless otherwise ordered.

SHIPPING POWDER (*extra strength*) is packed in six sizes of grain, TPG (coarsest), F, FF, FG, FFG, FFFG (finest).

SAFETY FUSE

Is of 8 qualities: Hemp, Cotton, Superior Mining, Single-Taped, Double-Taped, Triple-Taped, Small Gutta Percha, Large Gutta Percha, the qualities in greatest demand being Cotton and Single-Taped.

12 inches of Hemp Fuse will burn out in about 9 seconds.

12	"	Cotton Fuse	"	"	15	"
12	"	Single-Taped Fuse	"	"	18	"
12	"	Double-Taped Fuse	"	"	20	"

Taped Fuse is made to resist influence of water and severe tamping.

Safety Fuse is packed in barrels, each barrel containing a uniform number of feet, *viz* :

Cotton Fuse	14,000	feet in each barrel.
Hemp	10,000	" "
Single-Tape Fuse	8,000	" "
Double-Tape Fuse	7,000	" "
Triple-Tape Fuse	5,000	" "

ATLAS POWDER.

Put up in cartridges of either 6 or 8 inches in length, and from ⅞ of an inch to 2 inches in diameter, and packed in 25-lb., 50-lb. short and 50-lb long boxes (the last, for convenience in handling, contain the powder in five 10-lb. paper boxes placed inside of the wood box.)

Boxes marked	**E**	contain	20	per cent.	Nitro-Glycerine	Powder		
" "	**E**–|–	"	25	"	"	"	"	
" "	**D**	"	30	"	"	"	"	
" "	**D**–|–	"	35	"	"	"	"	
" "	**C**	"	40	"	"	"	"	
" "	**C**–|–	"	45	"	"	"	"	
" "	**B**	"	50	"	"	"	"	
" "	**B**–|–	"	60	"	"	"	"	
" "	**A**	"	75	"	"	"	"	

Taking "Atlas C Powder" as a standard, a single cartridge of that grade will weigh in ounces, according to its diameter and length, as follows:

Size of Cartridge	Weight in Ounces of each Cartridge.	Size of Cartridge.	Weight in Ounces of each Cartridge.
⅞ × 6	3⅓	⅞ × 8	4¼
1 × 6	4⅓	1 × 8	5¾
1⅛ × 6	5⅓	1⅛ × 8	6⅞
1¼ × 6	6¾	1¼ × 8	8
1⅜ × 6	9⅞	1⅜ × 8	12¼
1½ × 6	13⅓	1¾ × 8	16
1¾ × 6	13⅔	2 × 8	20
2 × 6	13⅔		

NOTE.—For low r grades, reduce weight of Cartridge; for higher grades increase weight of cartridge.

Headquarters for Agricultural Implements.

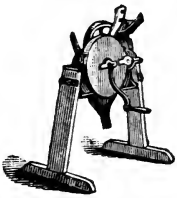
Copper Strip Feed Cutters.

Lever Feed Cutters.

Family Cider Mill.

Union Cider Mill.

Clinton Sheller.



Burrall Sheller.

Wagon Jack.

Store Trucks.

Champion Barrows.

Canal Barrows.

Garden Barrows.

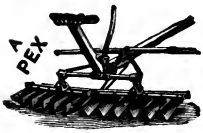
Feed Box.

Hay Rack.

Corn Mill.

Cultivators.

Presses.



Apex Harrow

Lawn Rollers.

Road Scrapers.

Press Screw

We have the finest and best illustrated Agricultural Implement Catalogue in this country, which we furnish to dealers only, on application. We sell our goods which are second to none, at the very lowest market price. Address

METROPOLITAN AGRICULTURAL WORKS.

H. B. GRIFFING'S SONS & CO. **70 Cortlandt St., NEW YORK.**

QUANTITY OF SEED REQUIRED

TO PRODUCE A GIVEN NUMBER OF PLANTS AND SOW A GIVEN AMOUNT OF GROUND.

	Quantity per acre.
Artichoke, 1 oz. to 500 plants	½ lb.
Asparagus, 1 oz. to 200 plants	5 lbs.
Barley	2½ bu.
Beans, dwarf, 1 quart to 150 feet of drill	1¼ "
Beans, pole, 1 quart to 200 hills	½ "
Beet, garden, 1 oz. to 100 feet of drill	10 lbs.
Beet, Mangel, 1 oz. to 150 feet of drill	6 "
Brocoli, 1 oz. to 3,000 plants	5 oz.
Broom Corn	10 lbs.
Brussels Sprouts, 1 oz. to 3,000 plants	5 "
Buckwheat	½ bu.
Cabbage, 1 oz. to 3,000 plants	5 oz.
Carrot, 1 oz. to 250 feet of drill	2½ lbs.
Cauliflower. 1 oz. to 3,000 plants	5 oz.
Celery, 1 oz. to 10,000 plants	4 "
Clover, Alsike and White Dutch	6 lbs.
" Lucerne, Large Red and Crimson Trefoil	8 "
" Medium	10 "
Collards, 1 oz. to 2,500 plants	6 oz.
Corn, sweet, 1 quart to 500 hills	8 qts.
Cress, 1 oz. to 150 feet of drill	8 lbs.
Cucumber, 1 oz. to 80 hills	1¼ "
Egg Plant, 1 oz. to 2,000 plants	8 oz.
Endive, 1 oz. to 300 feet of drill	3 lbs.
Flax, broad cast	½ bu.
Garlic, bulbs, 1 lb. to 10 feet of Drill	2½ "
Gourd, 1 oz. to 25 hills	2 bu.
Grass, Blue Kentucky	1 "
" Blue English	½ "
" Hungarian and Millet	3 "
" Mixed Lawn	
" Orchard, Perennial Rye, Red Top, Fowl Meadow and Wood Meadow	2 "
Hemp	½ bu.
Kale, 1 oz. to 3,000 plants	4 oz.
Kohl Rabi, 1 oz. to 200 feet of drill	1½ lbs.
Leek, 1 oz. to 250 feet of drill	4 "
Lettuce, 1 oz. to 250 feet of drill	3 "
Martynia, 1 oz. to 50 feet of drill	10 "
Melon, Musk, 1 oz. to 100 hills	1¾ "
Melon, Water, 1 oz. to 25 hills	1½ "
Nasturtium, 1 oz. to 50 feet of drill	10 "
Oats	2½ bu.
Okra, 1 oz. to 50 feet of drill	10 lbs.
Onion Seed, 1 oz. to 200 feet of drill	5 "
" " for Sets	30 "
Onion Sets, 1 quart to 20 feet of drill	8 bu.
Parsnip, 1 oz. to 250 feet of drill	5 lbs.
Parsley, 1 oz. to 250 feet of drill	8 "
Peas, garden, 1 quart to 150 feet of drill	1½ bu.
" field	2½ "
Pepper, 1 oz. to 1,500 plants	4 oz.
Potatoes	8 bu.
Pumpkin, 1 quart to 300 hills	4 qts.
Radish, 1 oz. to 150 feet of drill	8 lbs.
Rye	1½ bu.
Salsify, 1 oz. to 60 feet of drill	8 lbs.
Spinage, 1 oz. to 150 feet of drill	10 "
Summer Savory, 1 oz. to 500 feet of drill	2 "
Squash, summer, 1 oz. to 40 hills	2 "
" winter, 1 oz. to 10 hills	3 "
Tomato, 1 oz. to 3,000 plants	3 oz.
Tobacco, 1 oz. to 5,000 plants	2 "
Turnip, 1 oz. to 250 feet of drill	1½ lbs.
Vetches	2 bu.
Wheat	1 to 2 "

Velocity and Force of the Wind.

DESCRIPTION.	Miles per Hour.	Feet per minute.	Feet per second,	Force in lbs. per sq. foot.
Hardly perceptible	1	88	1.47	.065
Just perceptible	2	176	2.93	.020
	3	264	4.4	.044
Gentle Breeze	4	352	5.87	.079
	5	440	7.33	.123
Pleasant Breeze	10	880	14.67	.492
	15	1320	22	1.107
Brisk Gale	20	1760	29.3	1.968
	25	2200	36.6	3.075
High Wind	30	2640	44.	4.428
	35	3080	51.3	6.027
Very high Wind	40	3520	58.6	7.872
	45	3960	66.	9.963
Storm	50	4400	73 3	12.300
	60	5280	88.	17.712
Great Storm	70	6160	102.7	24.108
	80	7040	117.3	31.488
Hurricane	100	8800	146 6	49.200

SUPERIOR LAWN MOWER.

SOME SPECIAL

1st—The ease and quickness with which **it can be adjusted to cut High and Low grass**; in a moment you can vary the cut from one-half to three and one-half inches.

2d—It is the only Mower in the market where the same machine CAN, IN A MOMENT, BE ADJUSTED TO CUT grass from ONE TO TWELVE INCHES high.

3d—Being a FRONT-CUT MACHINE the operator is enabled to cut grass close up to walls, fences, trees, etc.

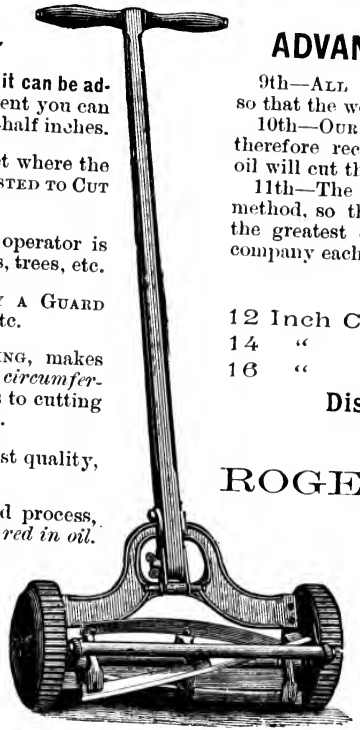
4th—The Reel Knives are PROTECTED BY A GUARD to prevent them from cutting shrubbery, etc.

5th—The ratchet or pawl has NO SPRING, makes scarcely any noise, *has eight catches in a circumference of three inches*, so that the reel starts to cutting the moment the machine is started forward.

6th—The material used is of the very best quality, so that BREAKAGES SELDOM IF EVER OCCUR.

7th—The KNIVES are made by a patented process, *of the best steel*, and are hardened and *tempered in oil*.

8th—They are made with the DOUBLE GEAR, giving it ease of motion, combined with strength, ENABLING ONE TO CUT GRASS RAPIDLY going at a slow rate of speed.



ADVANTAGES.

9th—ALL THE BEARINGS in the Mower ARE LONG, so that the wear will be very slow.

10th—OUR PAWLS WILL NOT GUM OR STICK; we therefore recommend to oil with machine oil. Coal oil will cut the bearings.

11th—The machine is sharpened by a very simple method, so that EVEN A CHILD CAN SHARPEN IT with the greatest ease. A Crank and full directions accompany each machine.

PRICE LIST:

12 Inch Cut,	- - -	$13.00
14 " "	- - - -	15.00
16 " "	- - -	17.00

Discount to the Trade.

MANUFACTURED BY THE

ROGERS FENCE CO.,

Springfield, Ohio.

Sole Agents for New York City.

Quackenbush, Townsend & Co.,

85 Chambers and

67 Reade Sts.

Dimensions of Cylindrical Vessels.

It will be useful for tinners to know how to calculate the contents in gallons of cylindrical vessels. This is easily done by this formula: Square the diameter (in inches and decimal parts of an inch), multiply it by the height, then multiply the product by .0034 for wine gallons, or by .002785 for beer gallons.

Tinners are often called upon to construct a can or other cylindrical vessel to contain a certain number of gallons. The following table, furnished by an experienced tinner, gives the dimensions of cylindrical vessels which cut to advantage from tin or galvanized iron:

Gallons.	Diameter.	Height.	Gallons.	Diameter.	Height.
1	6¾	6¾	30	18½	26½
2	8½	8¾	35	18⅝	30½
3	9	11½	40	18¾	34
4	10½	13¾	50	20½	35
5	11½	11½	60	22½	38
6	11⅝	13½	70	23	40
10	13½	16½	80	24½	40
15	15⅝	19	90	24½	45
20	16	23	100	26	45
25	18	23			

Table of Dimensions of Various Measures of Capacity.

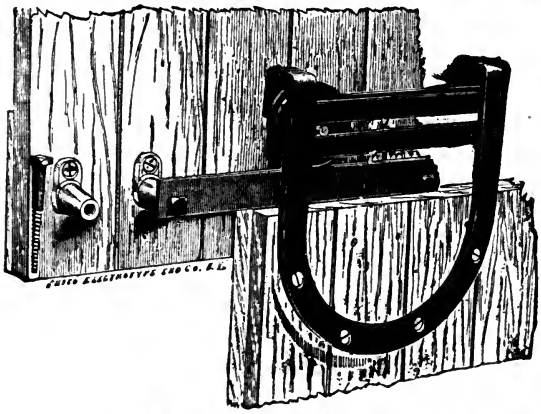
Size.	Diameter of Top.	Diameter of Bottom.	Height.
	Inches.	Inches.	Inches.
1 gallon.	5½	6⅛	9¼
½ "	4	4⅞	8
1 quart.	3½	4	5¾
1 gallon.	4	7	8½
½ "	6½	4	4
5 "	8	11⅛	12⅞
3 "	7	11⅝	10½
2 "	6	10½	8⅞
1 "	3¾	8¾	7¾
20 quarts.	19½	13	8
16 "	18	11¼	6¼
14 "	15¼	9¼	6¼
10 "	14½	11	4⅛
1 pint.	2⅞	3⅛	4¼
½ "	2⅜	2⅞	3⅛
3 quarts.	3½	6	8½
1 pint.	4¼	3¾	2⅝
½ gallon.	3½	6⅝	6¼
1 "	2½	5⅛	5
1 "	2	4⅛	4⅛
½ "	1¾	3¼	3⅛
2 quarts.	9	6	3¾
3 pints.	8¼	5¾	2¾
1 pint.	6¼	4	2¾
Pie.	9	7½	1¾

Capacity of Boxes.

A box 24 by 16 inches and 28 inches deep will contain 5 bushels.
A box 24 by 16 inches and 14 inches deep will contain 2½ bushels.
A box 14 by 23⅛ inches and 10 inches deep will contain 1½ bushels.
A box 16 inches square and 8⅔ inches deep will contain 1 bushel.
A box 16 by 8⅔ inches and 8 inches deep will contain ½ bushel.
A box 8 inches square and 8⅔ inches deep will contain 1 peck.
A box 8 by 8⅔ inches and 4 inches deep will contain 1 gallon.
A box 8 by 4 inches and 4⅓ inches deep will contain ½ gallon.
A box 4 inches square and 4⅓ inches deep will contain 1 quart.

LANE'S
PATENT STEEL DOOR HANGER.

The most perfect Anti-Friction Hanger in the Market,



BECAUSE

It is made of steel throughout, except the wheel, which has a steel axle. It will not break It is practically free from wear, It is almost noiseless in action. It requires no oil. It has a broad bearing on the door and keeps in line. It is by far the most durable. It may be used with any track. It is always in order.

LANE'S PATENT TRACK

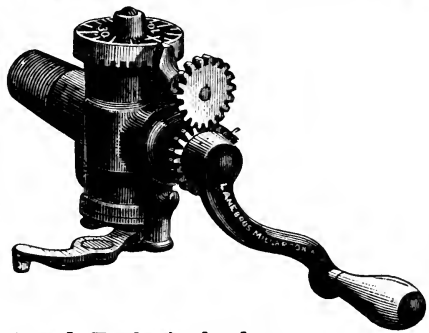
Is made of steel and is easily put in position. Catches and holds no snow or ice. Door hung thereon cannot jump the track. Is not subject to decay. Requires no fitting, but is ready at once. May be used with hangers of other manufacture.

LANE'S MEASURING FAUCET.

PRICE, $3.00.

For Light or Heavy Molasses, Oils, Varnishes or other Fluids.

We warrant these Faucets to to be as represented, measuring correctly and working more easily in heavy molasses than any Measuring Faucet in the market. No grocer can afford to be without them, for they save time, and "time is money." They insure perfect cleanliness, requiring no tin measures or funnel to collect dirt and draw flies. They do not drip. They prevent all waste, as no molasses or other fluid can pass except when the crank is turned. They are the embodiment of simplicity, and consequently they are always in order. They work easily in the heaviest molasses. They are warranted to measure correctly, according to U. S. Standard.



Manufactured Exclusively by

LANE BROS., Poughkeepsie, N. Y.

GENERAL AGENCY,

JOHN H. GRAHAM & CO., 113 Chambers St., New York.

Capacity of Cylindrical Cisterns or Tanks,

FOR EACH FOOT OF DEPTH.

Diameter in feet.	Gallons.	Pounds.	Diameter in feet.	Gallons.	Pounds.
2.0	23.5	196	9.0	475.9	3,968
2.5	36,7	306	9.5	530.2	4,421
3.0	52.9	441	10.0	587.5	4,899
3.5	72.0	600	11.0	710.9	5,928
4.0	94.0	784	12.0	846.0	7,054
4.5	119.0	992	13.0	992.9	8,280
5.0	146.9	1,225	14.0	1,151.5	9,602
5.5	177.7	1,482	15.0	1,321.9	11,023
6.0	211.5	1,764	20.0	2,350.1	19,596
6.5	248.2	2,070	25.0	3,672.0	30,620
7.0	287.9	2,401	30.0	5,287.7	44,093
7.5	330.5	2,756	35.0	7,197.1	60.016
8.0	376.0	3,135	40.0	9,400.3	78,388
8.5	424.5	3,540	. .	. . .	. . .

Rule for Measuring the Capacity of a Circular Cistern.

Multiply the square of the diameter by .7854, or the square of the circumference by .07958, in order to find the area of the cistern, then multiply the area by the depth in inches, and divide the product by 231. The quotient will equal the number of gallons the cistern will contain.

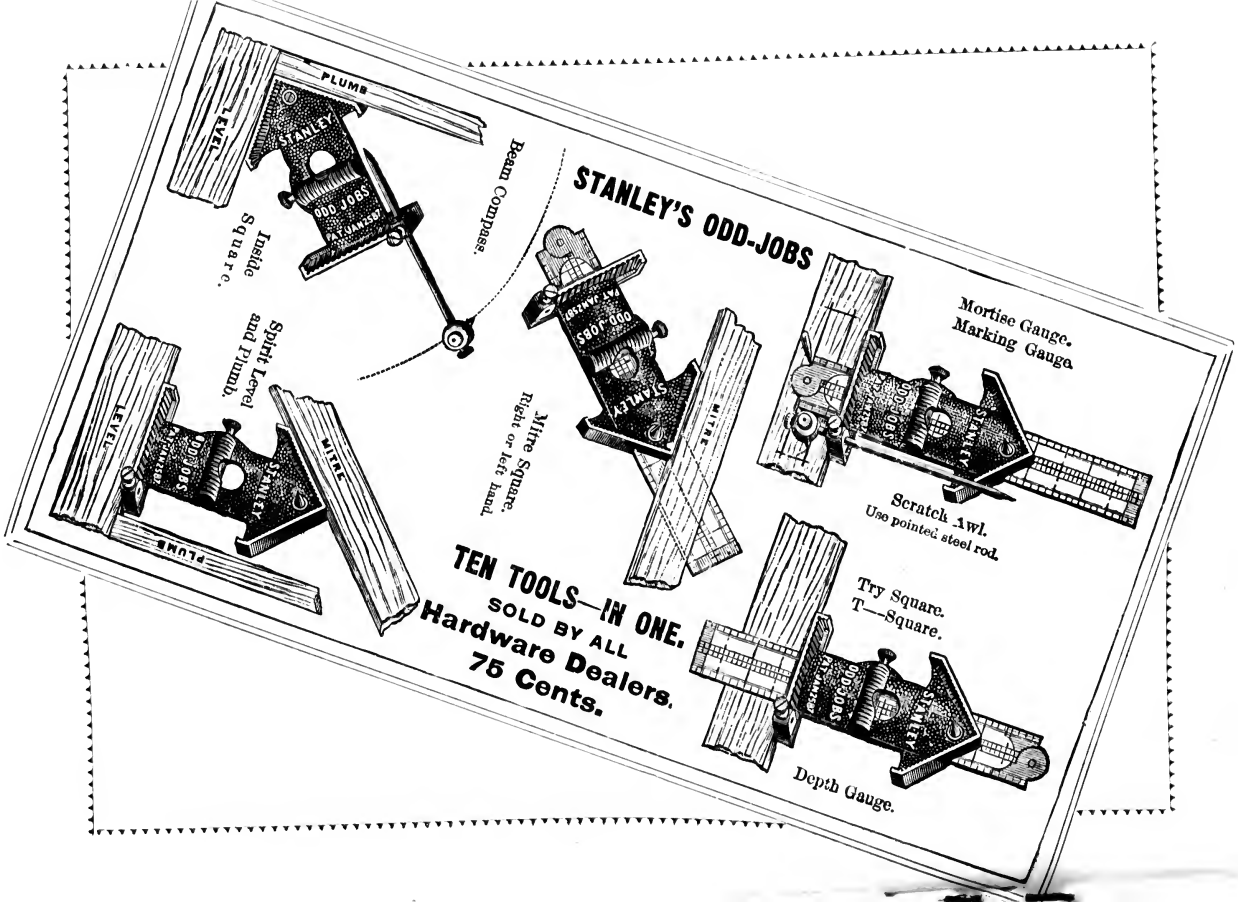
In measuring cisterns, etc., 31½ gallons are estimated to one barrel; 63 gallons to one hogshead.

Capacity of Cisterns in Barrels (31½ Gals.)

Depth 1 foot.		Depth 1 foot.	
Diameter.	Barrels.	Diameter.	Barrels.
Feet, 2	.74	Feet, 8½	13.47
" 2½	1.16	" 9	15.11
" 3	1.70	" 9½	16.81
" 3½	2.28	" 10	18.65
" 4	2.98	" 11	22.56
" 4½	3.77	" 12	26.85
" 5	4.66	" 13	31.61
" 5½	5.64	" 14	36.55
" 6	6.71	" 15	41.96
" 6½	7.88	" 20	74.60
" 7	9.13	" 25	116.57
" 7½	10.49	" 30	167.86
" 8	11.93		

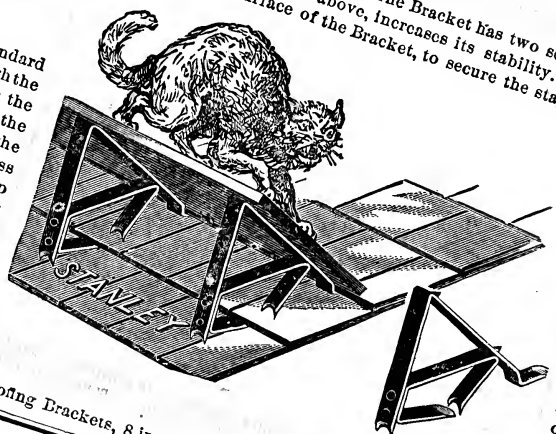
Rule for Measuring the Capacity of a Square Cistern.

Multiply the length in feet by the width in feet, and multiply that by 1.728, then divide by 231. The quotient will be the number of gallons capacity of one foot in depth.


STANLEY'S ODD-JOBS
PLUMB
LEVEL
STANLEY
ODD-JOBS
Inside Square.
Beam Compass.
Split Level and Plumb.
MITRE
Mitre Square. Right or left hand.
Mortise Gauge.
Marking Gauge.
Scratch Awl.
Use pointed steel rod.
Try Square.
T—Square.
Depth Gauge.
TEN TOOLS—IN ONE.
SOLD BY ALL
Hardware Dealers.
75 Cents.

The parts are of Spring Steel and firmly riveted together. The Bracket has two separate bearings on the roof, and is so formed that any increase of pressure from above, increases its stability. Two steel spurs project above the horizontal surface of the Bracket, to secure the staging boards.

Grasp the back standard with the fingers through the center part, and spring the bow open enough for the front prongs to clear the shingle butt; then press the two beveled ends up under the shingles already laid, until the front shoulder strikes the butt of the upper course.



Grasp the back standard with the fingers under the front of the bow; by a slight pressure with the hand, both sets of prongs can then be raised from contact with the shingles, thus releasing the Bracket, and leaving the roof without any nail-holes in the shingles.

No. 1. Roofing Brackets, 8 inch, ½ dozen in box..... Per Doz., $3.00

THE STAR HACK SAW has a file temper, and one 5-cent blade will do more work than $1 worth of files. It will cut off an inch square bar of steel 30 times.

THE STAR BUTCHER SAW will cut four times as long without filing as any other kind in use. It will cut off a half-inch rod of iron 30 times.

THE STAR BRACKET SAW is taking the place of all other kinds.

None of these Star Saws are to be filed, as the price is less than the cost of filing. They are taking the place of all other saws as fast as they become known.

PRICES

HACK SAW BLADES.

Length....	6 in.	7 in.	8 in.	9 in.	10 in.	11 in.	12 in.
Per doz....	$0.55	$0.60	$0.65	$0.70	$0.85	$0.95	$1.05

BUTCHER SAW BLADES.

Length....	14 in.	16 in.	18 in.	20 in.	22 in.	24 in.	26 in.
Per doz....	$1.08	$1.08	$1.20	$1.20	$1.32	$1.32	$1.44

BRACKET SAW BLADES.

Length....	000 to 6	7	8	9	10	11	12
Per gross..	$1.00	$1.10	$1.20	$1.30	$1.40	$1.50	$1.60